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(54) **VARIABLE STRIDE EXERCISE DEVICE WITH RAMP**

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A63B 22/04 (2006.01)

(52) **U.S. Cl.** **482/52**

(58) **Field of Classification Search** 482/1, 482/4–7, 51–53, 62, 70–71, 57; *A63B 22/04*
See application file for complete search history.

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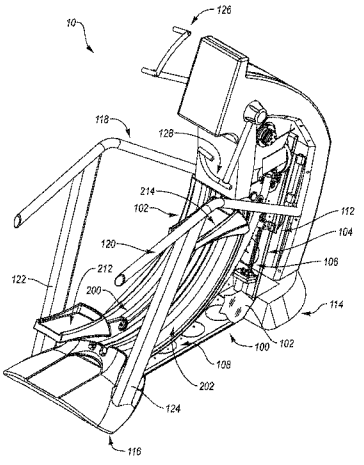
(57) **ABSTRACT**

A non-impact exercise device comprising a framework, at least one ramp assembly, a pair of foot support assemblies, a foot location control assembly, and means for adjusting the maximum stride length of the foot support assemblies. The foot support assemblies may advantageously be coupled to the foot location control assembly by a flexible cable linkage. The foot support assemblies each include a foot platform for the user to stand on. The foot support assemblies are coupled to the one or more ramp assemblies of the exercise device. The user exercises by putting force into the device through the foot platforms and/or handles. This causes the foot platforms to roll along the ramps while the user is standing upon the foot platforms. The user may readily vary the length and frequency of the reciprocating stride.

61 Claims, 19 Drawing Sheets



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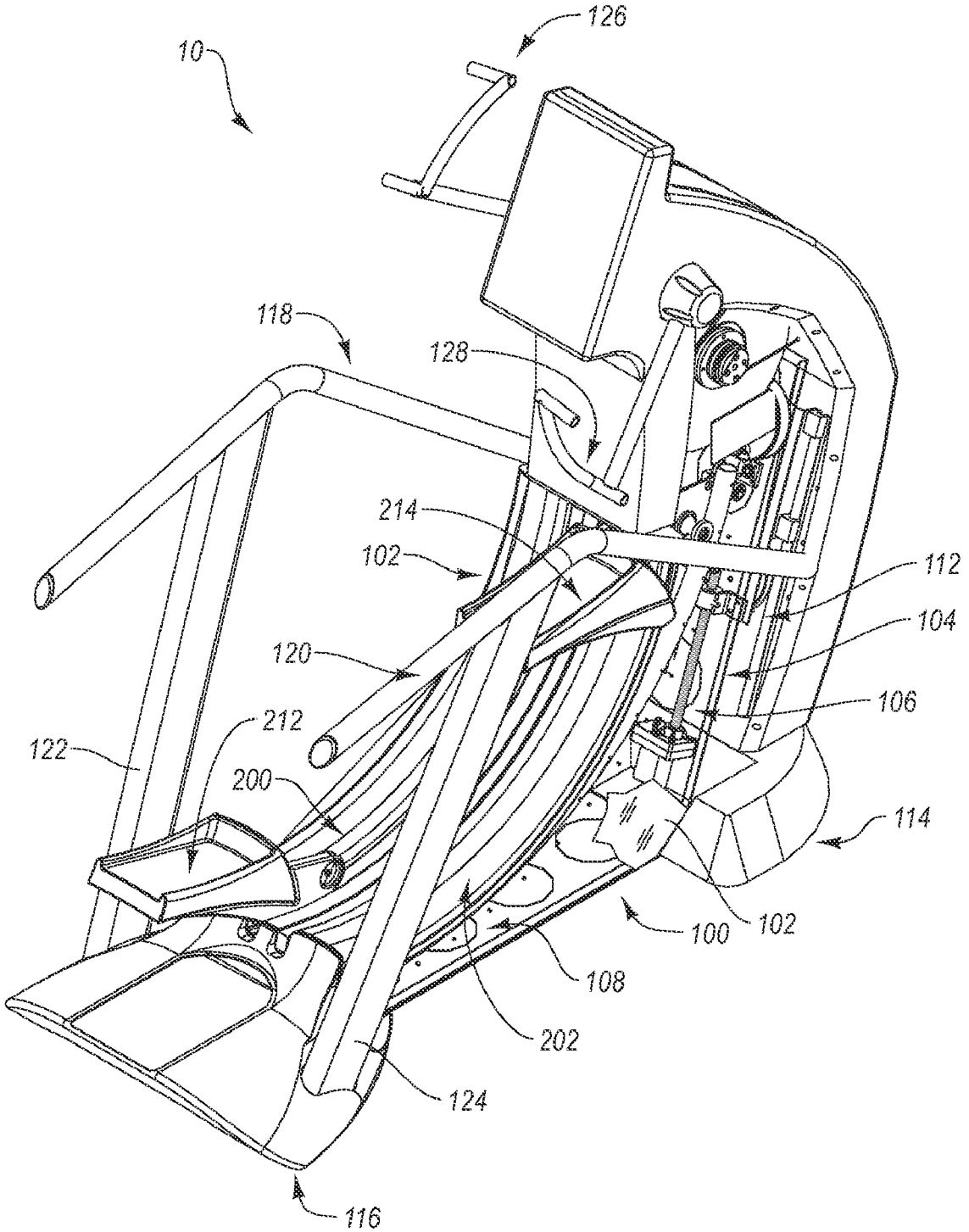
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FIG. 1

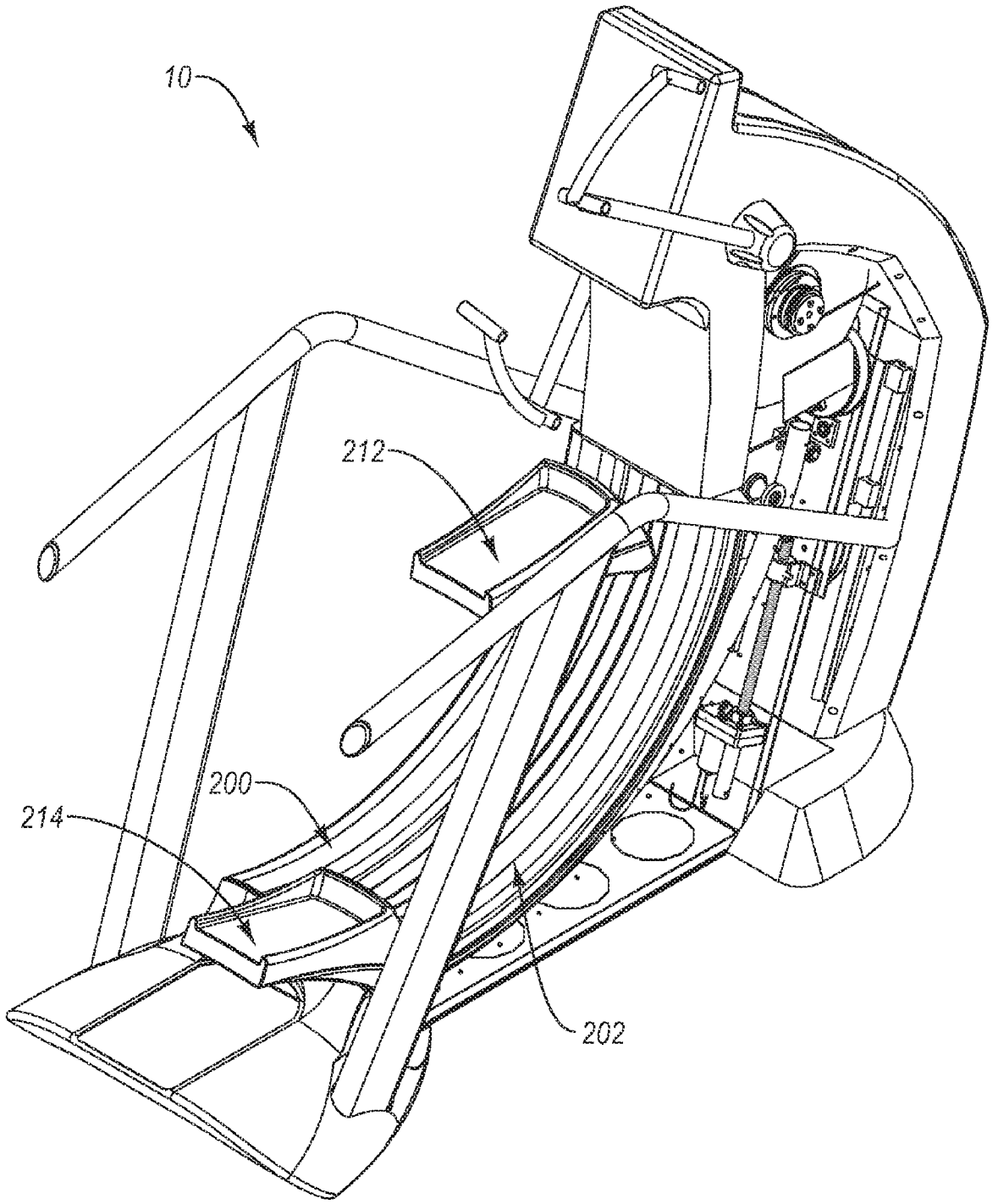


FIG. 2

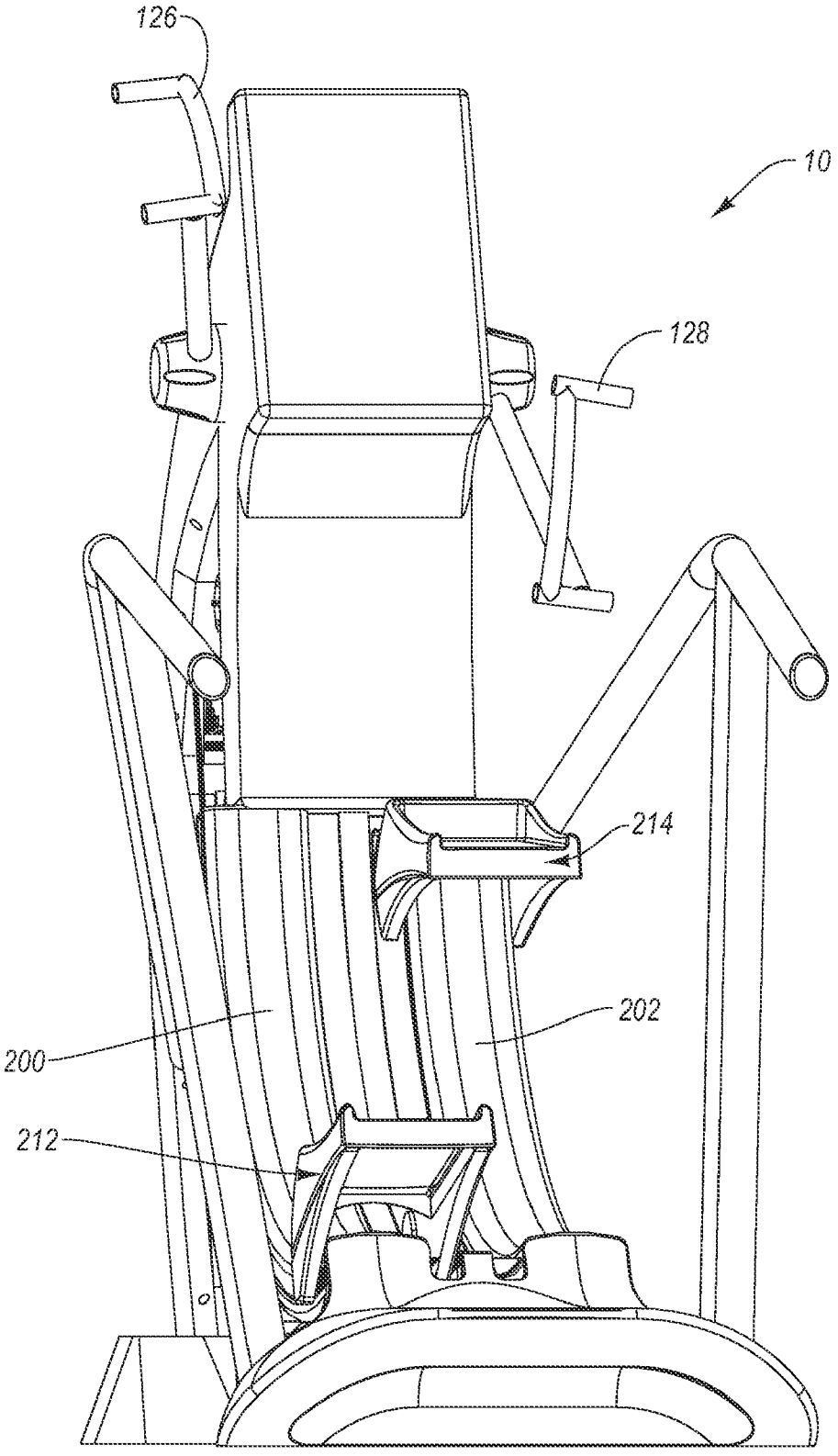


FIG. 3

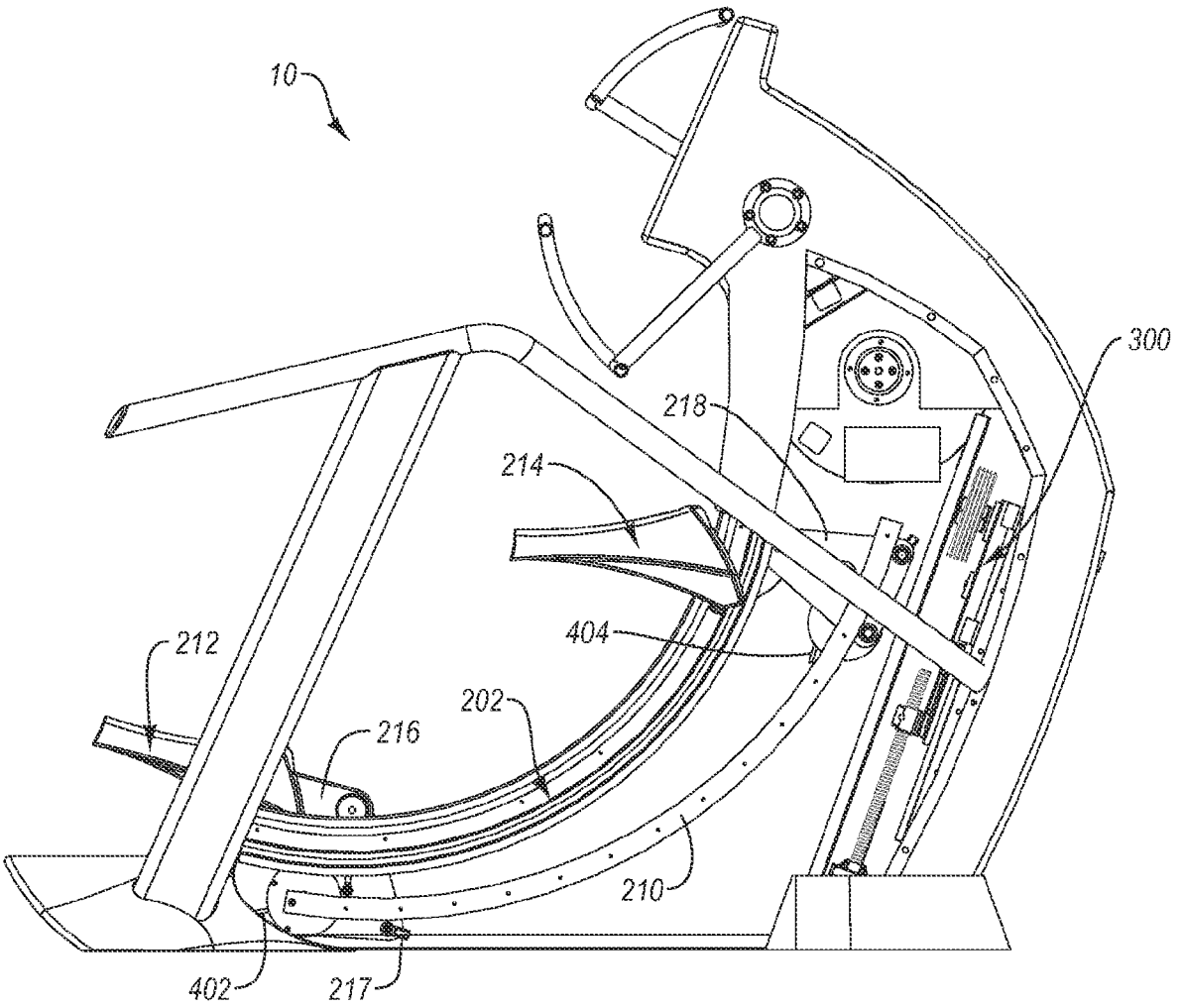
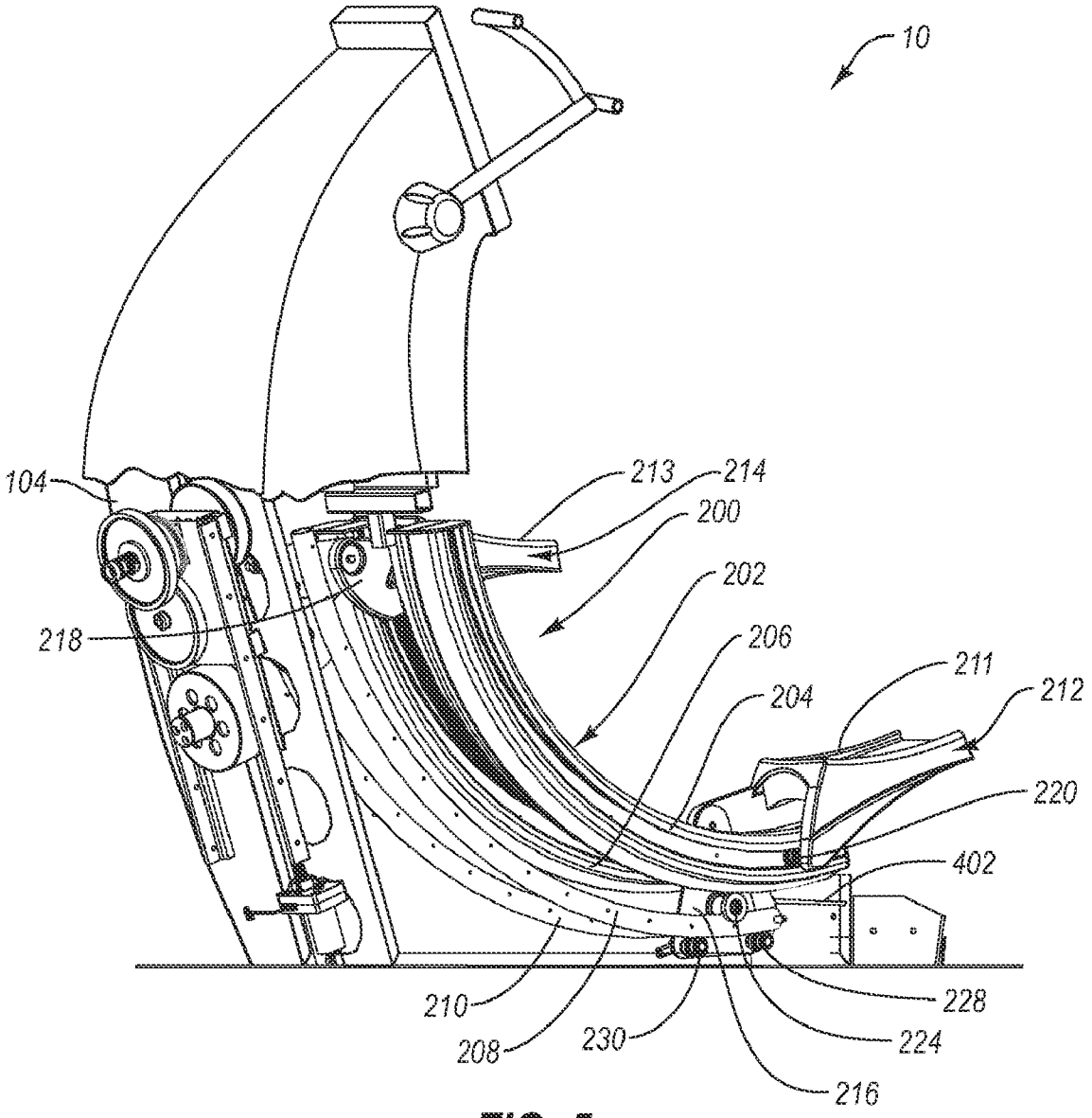


FIG. 4


10
104
213
214
200
202
218
206
211
212
204
220
402
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208
230
228
224
216

FIG. 5

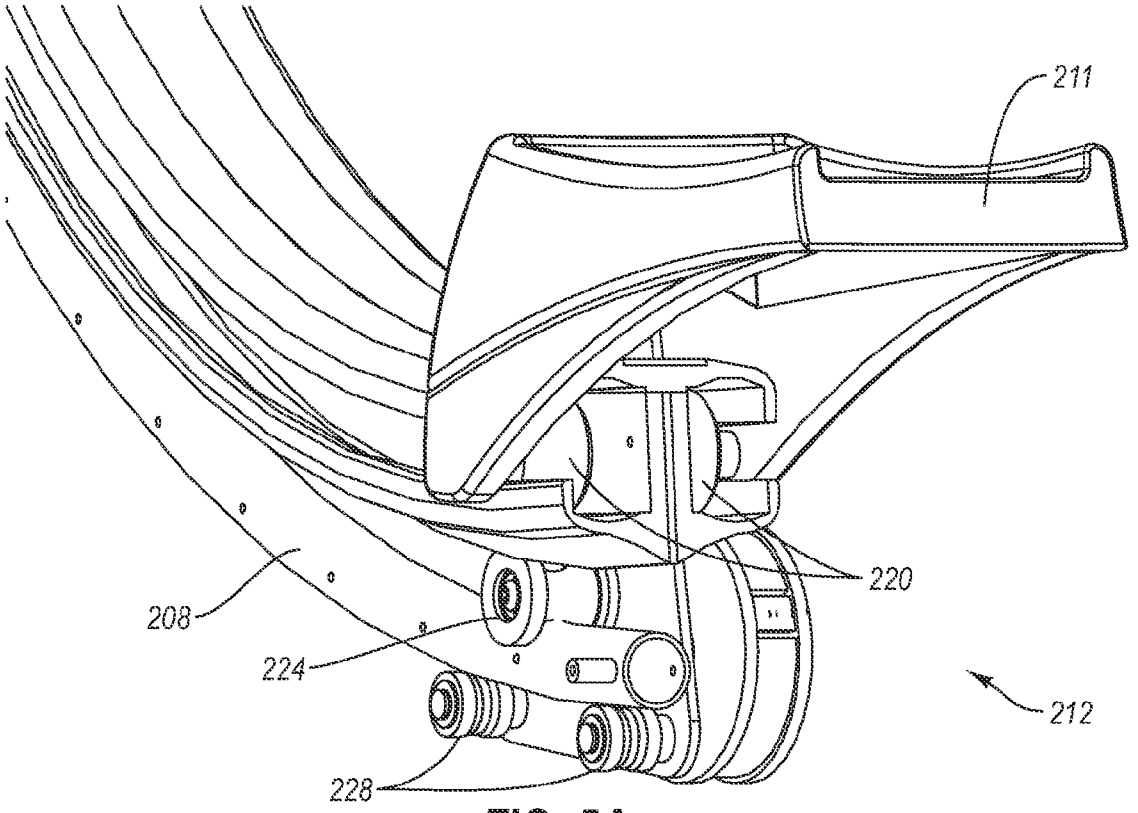


FIG. 5A

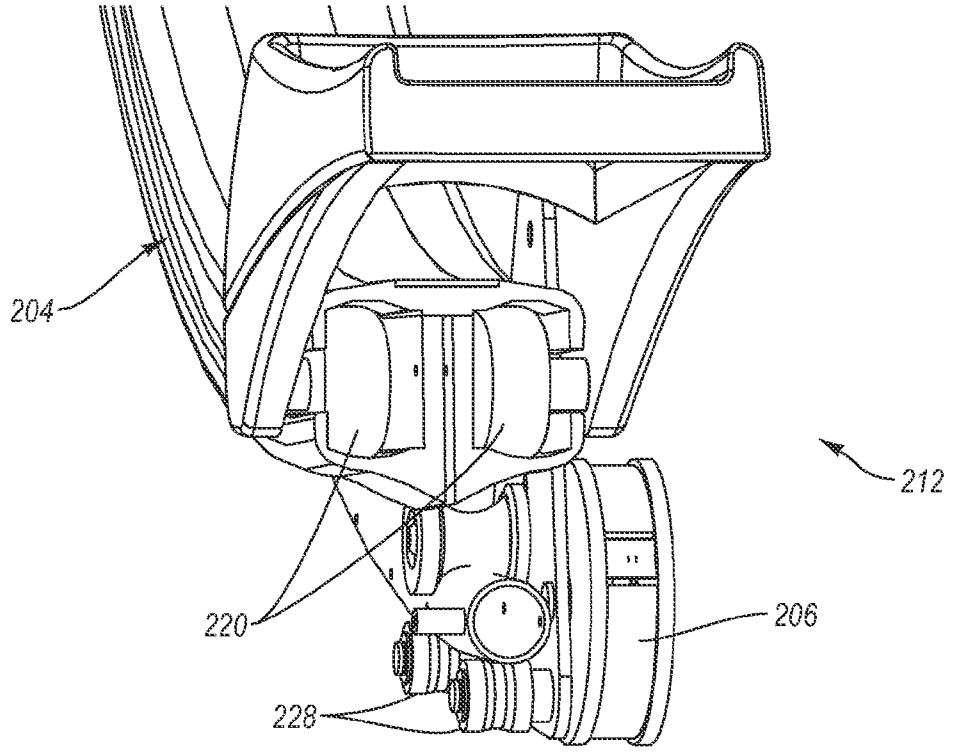


FIG. 5B

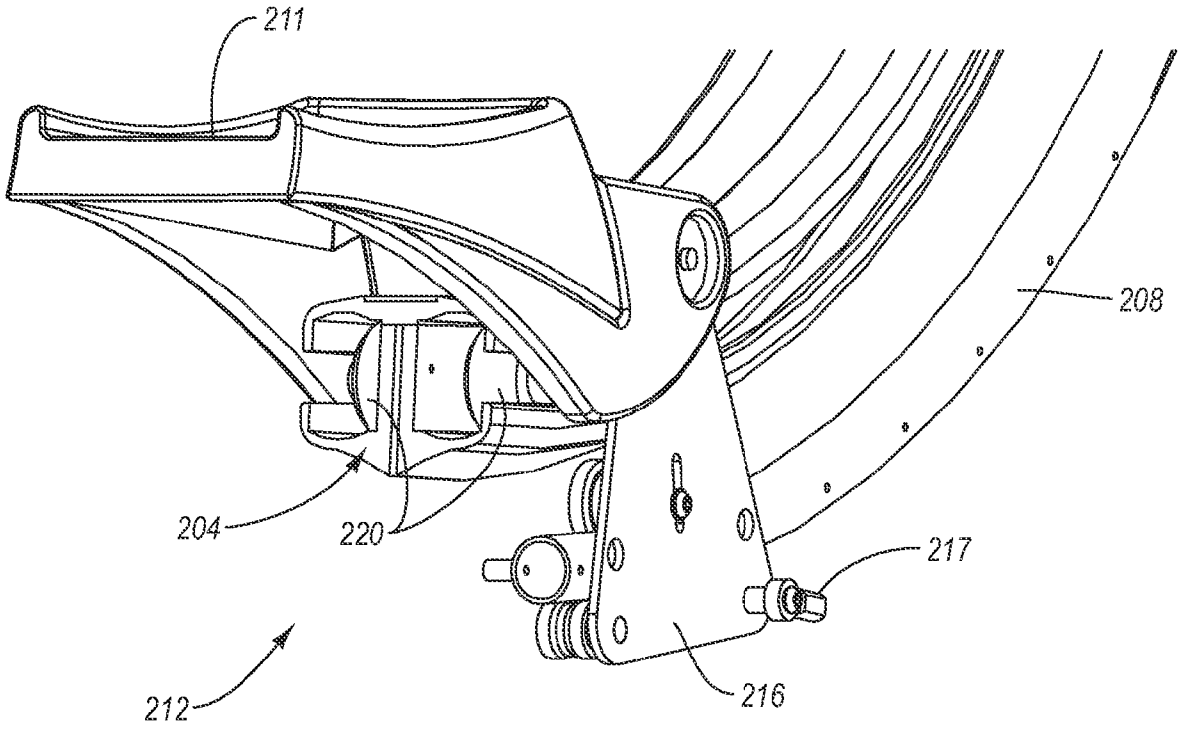


FIG. 5C

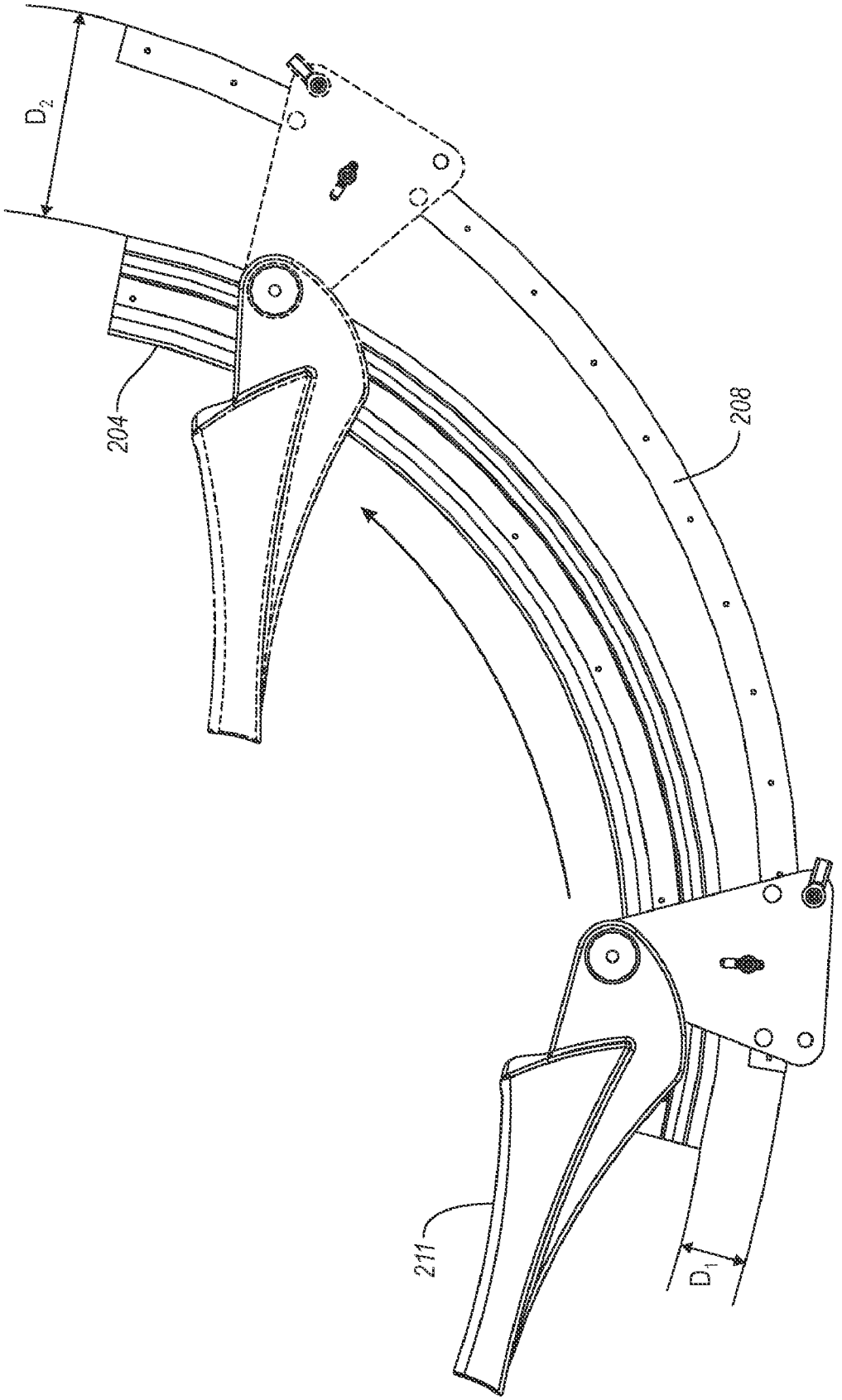
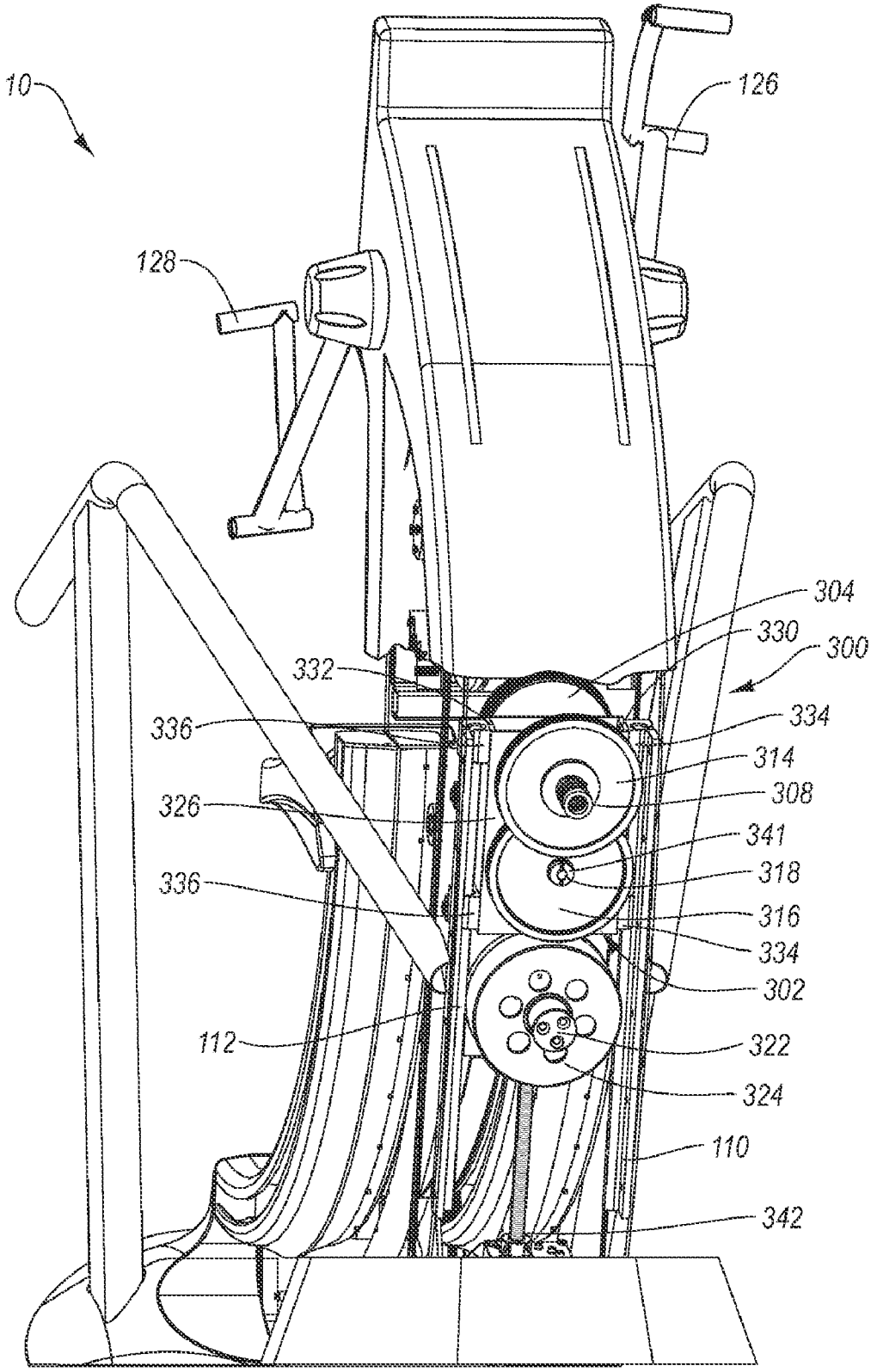


FIG. 5D


10
126
128
304
330
300
332
334
336
314
308
326
341
318
336
316
334
302
112
322
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110
342

FIG. 6

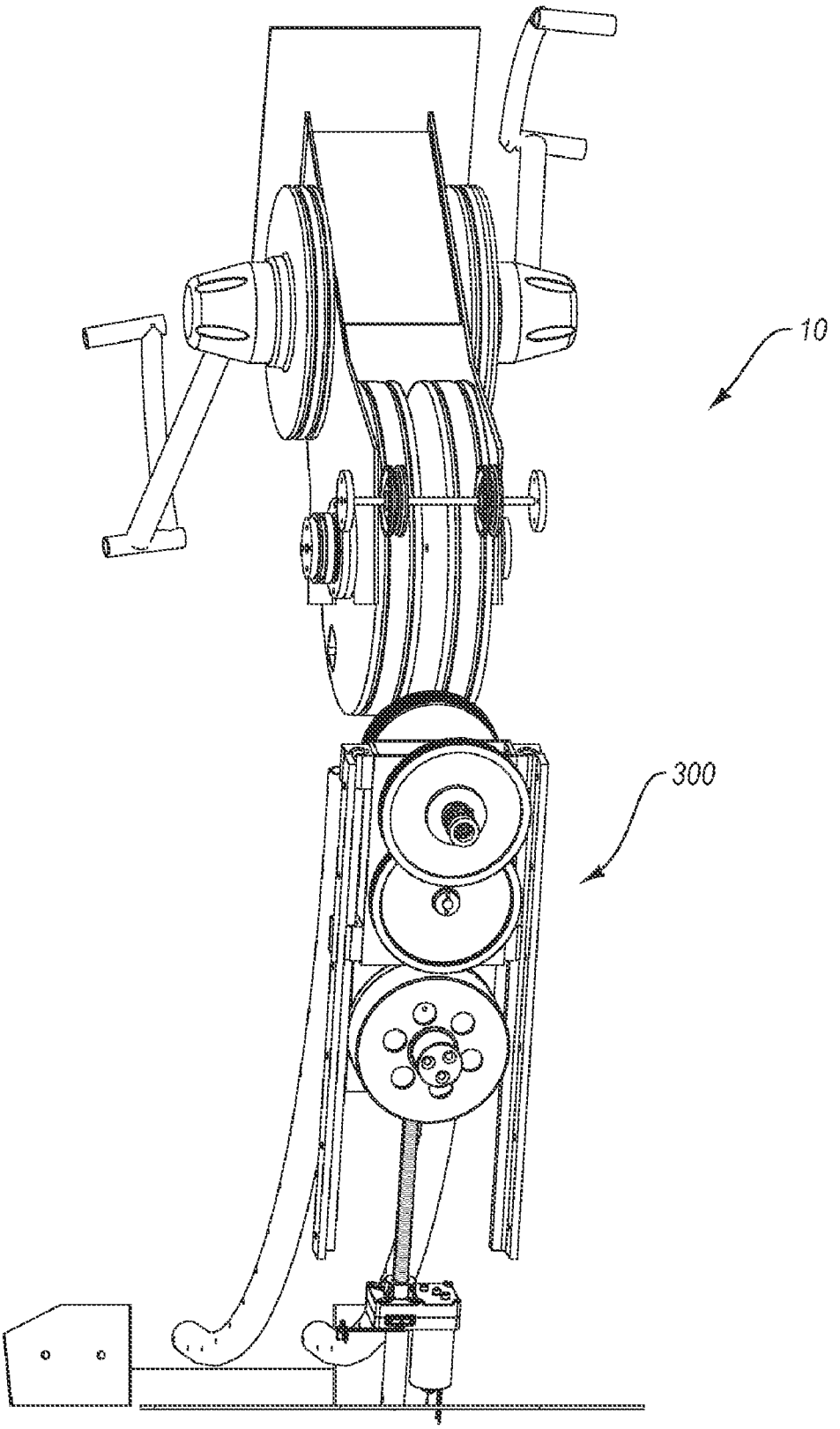


FIG. 6A

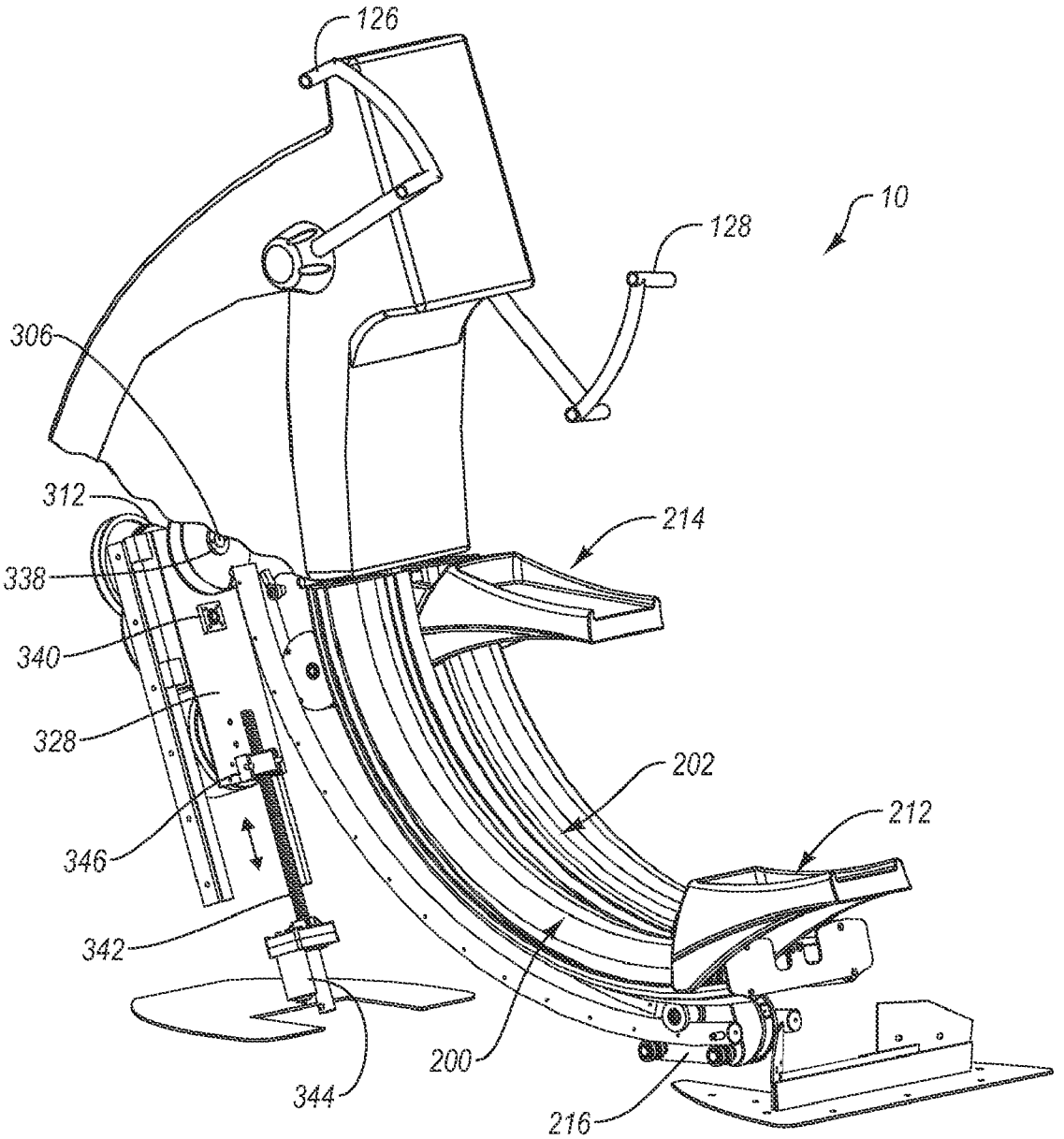
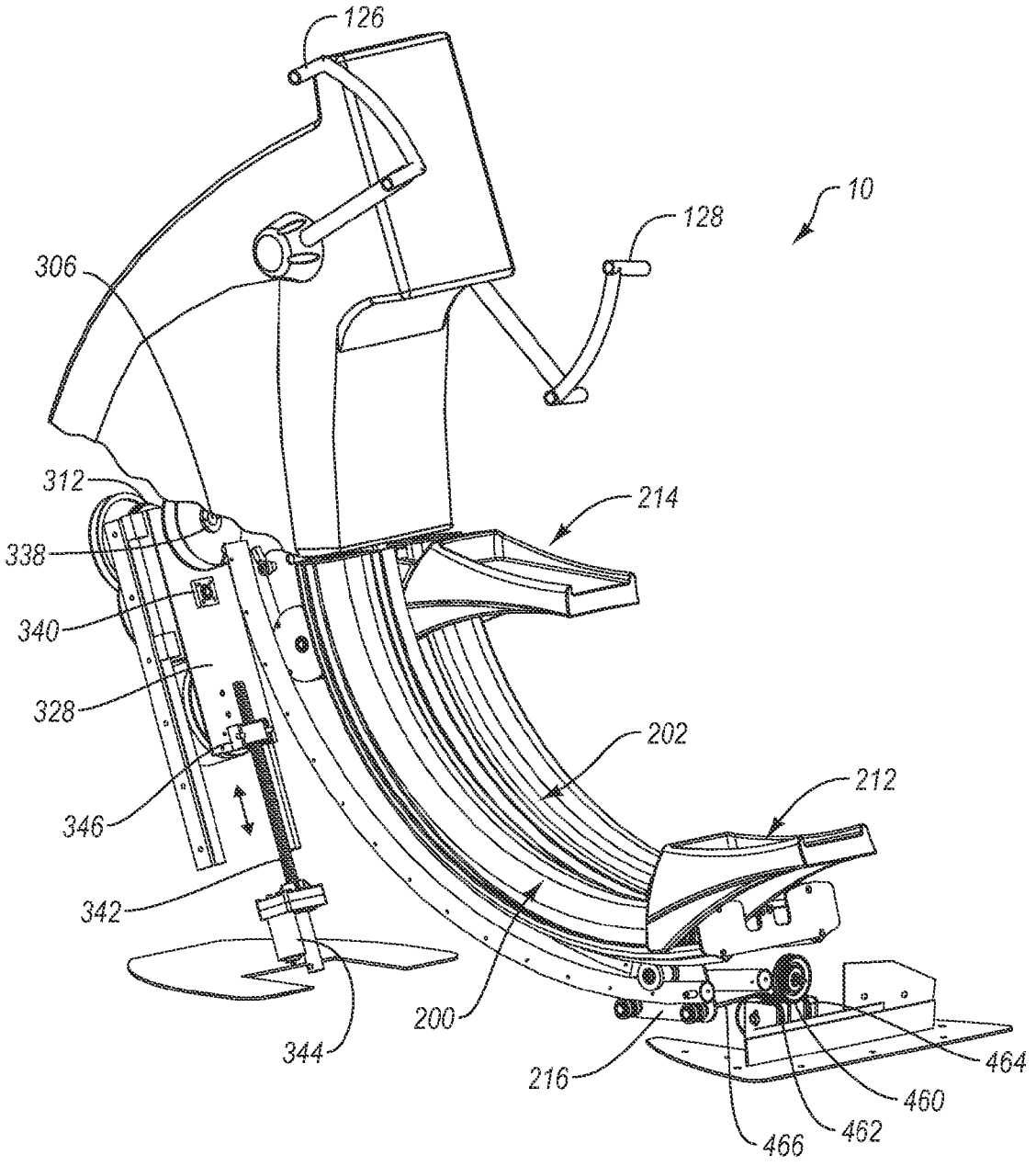


FIG. 7


126
10
128
306
312
214
338
340
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202
212
346
342
200
344
216
464
460
462
466

FIG. 7A

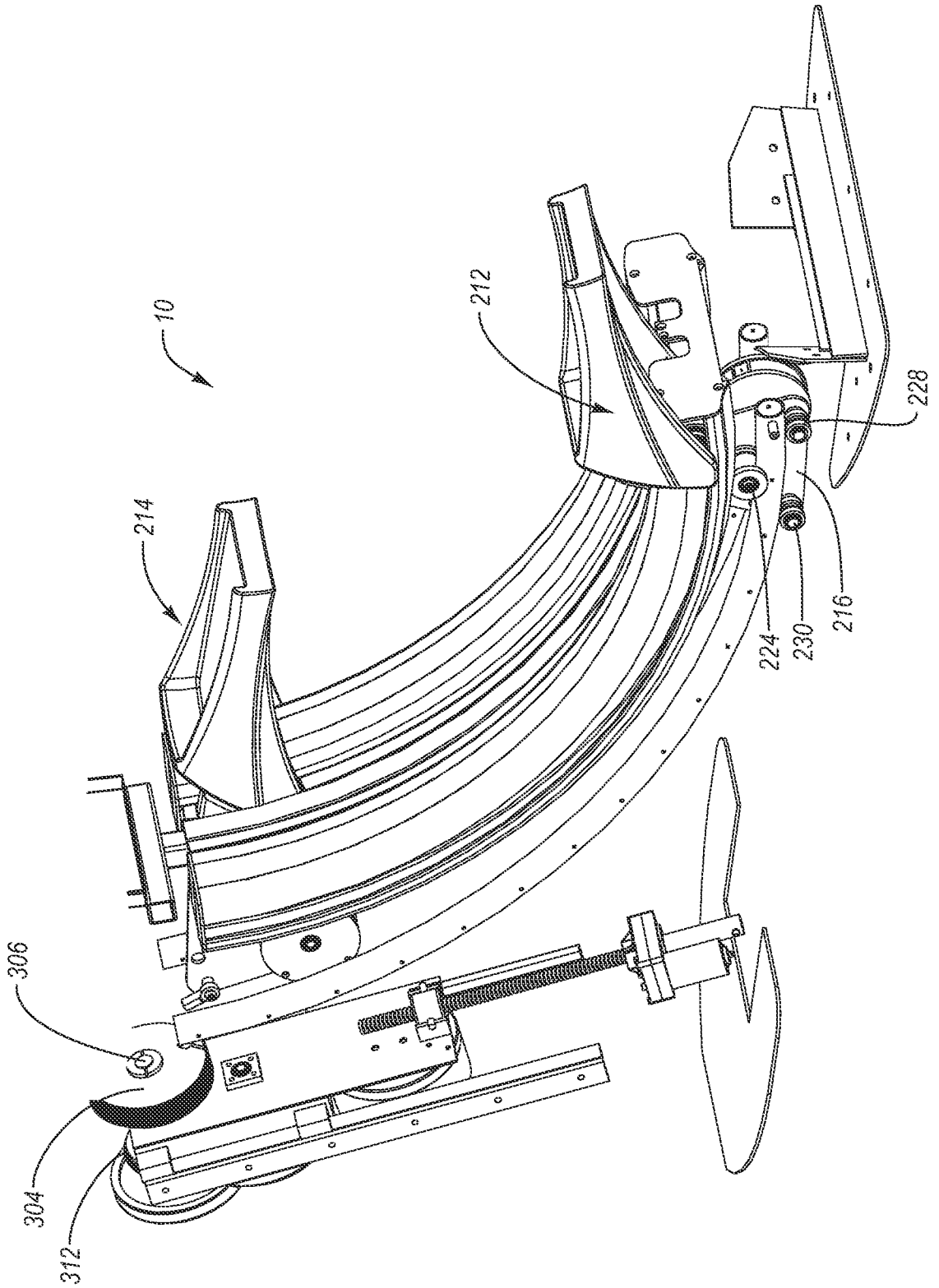
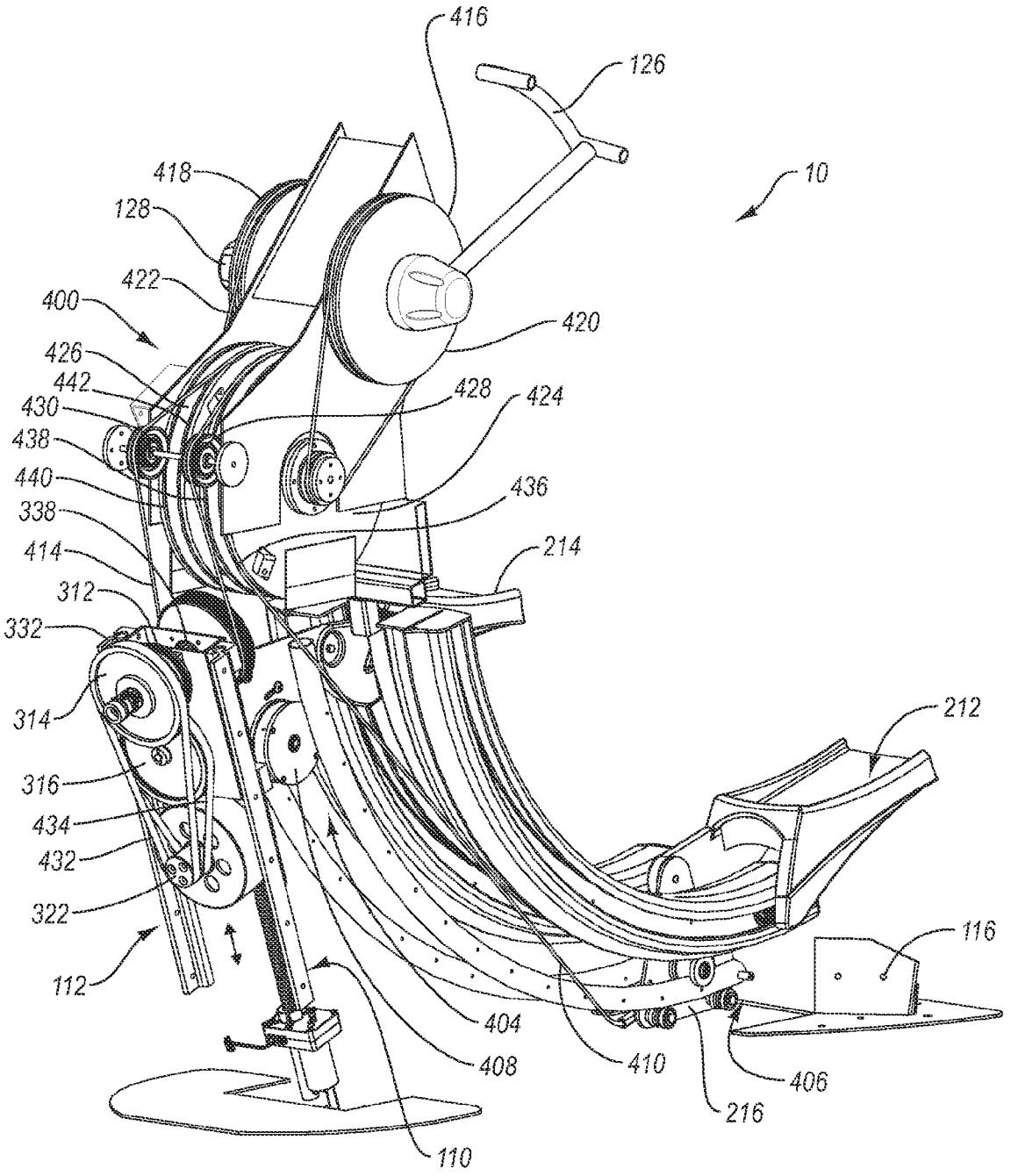


FIG. 8


416
126
418
10
128
422
400
420
426
442
428
424
430
438
436
440
338
214
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332
212
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434
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116
112
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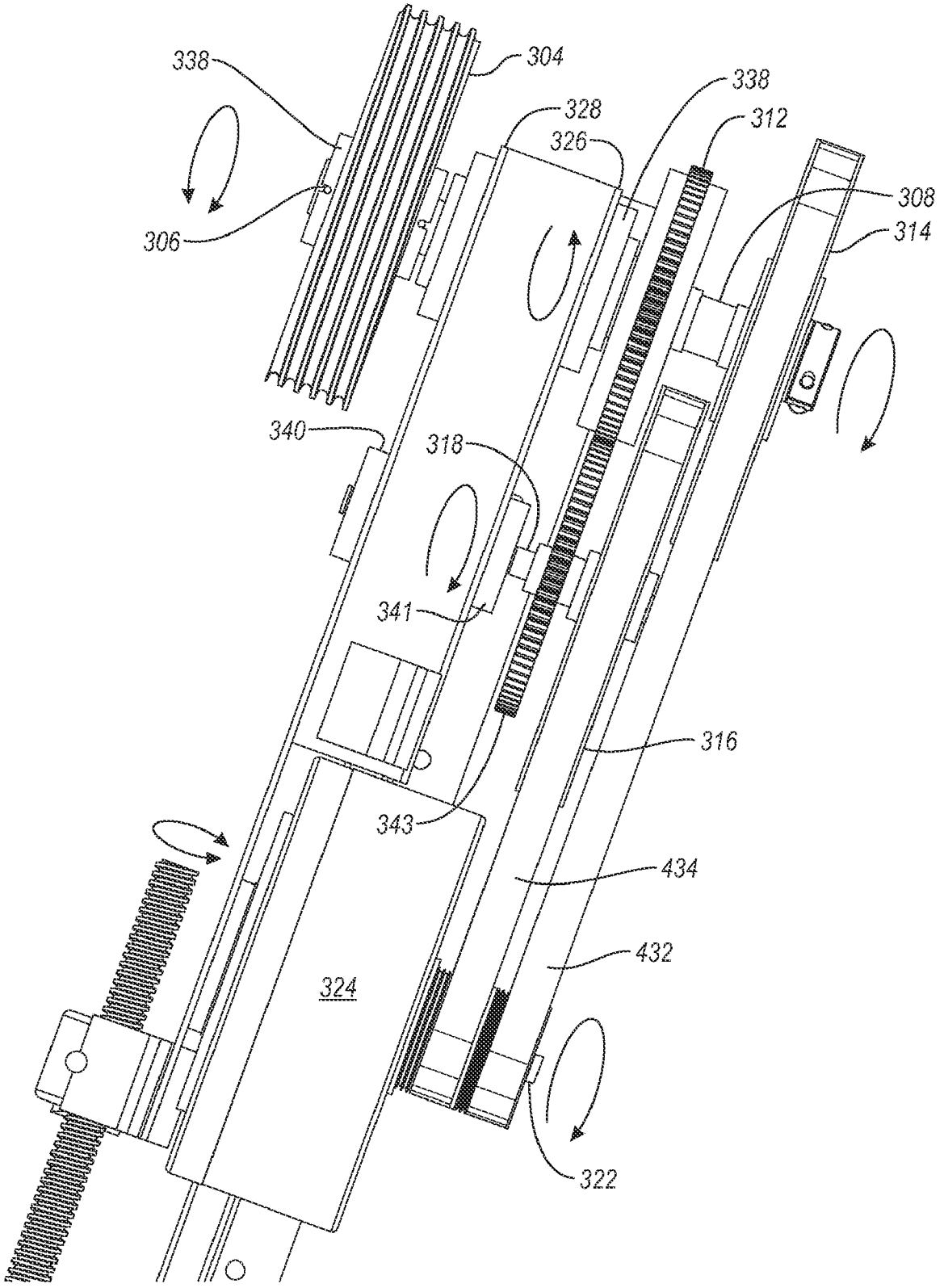
216
110

FIG. 9


338
304
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322

FIG. 9A

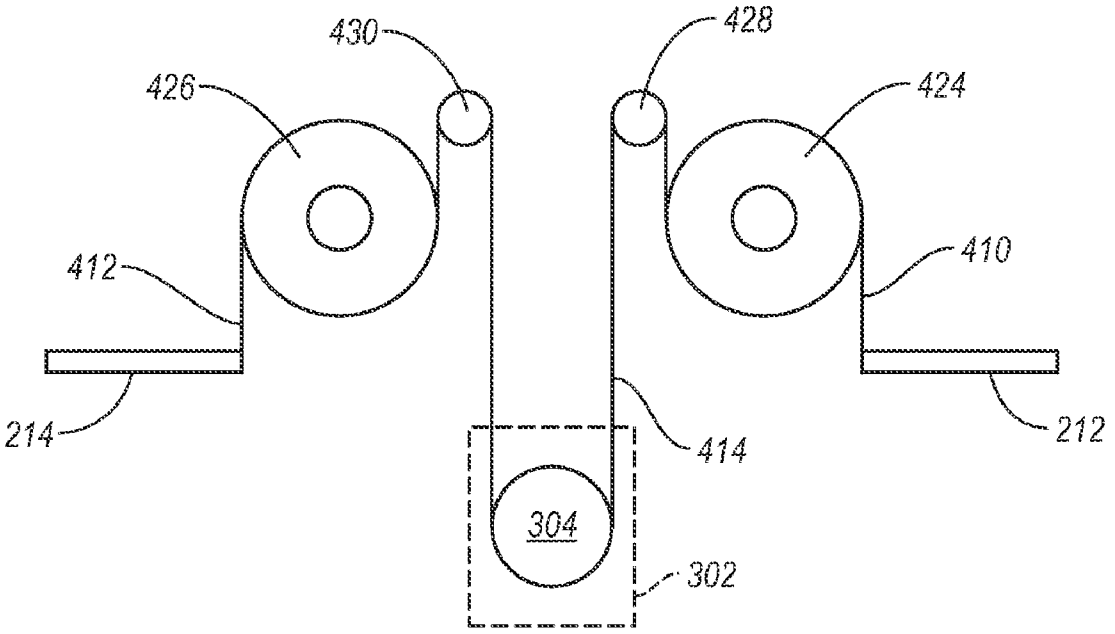


FIG. 10A

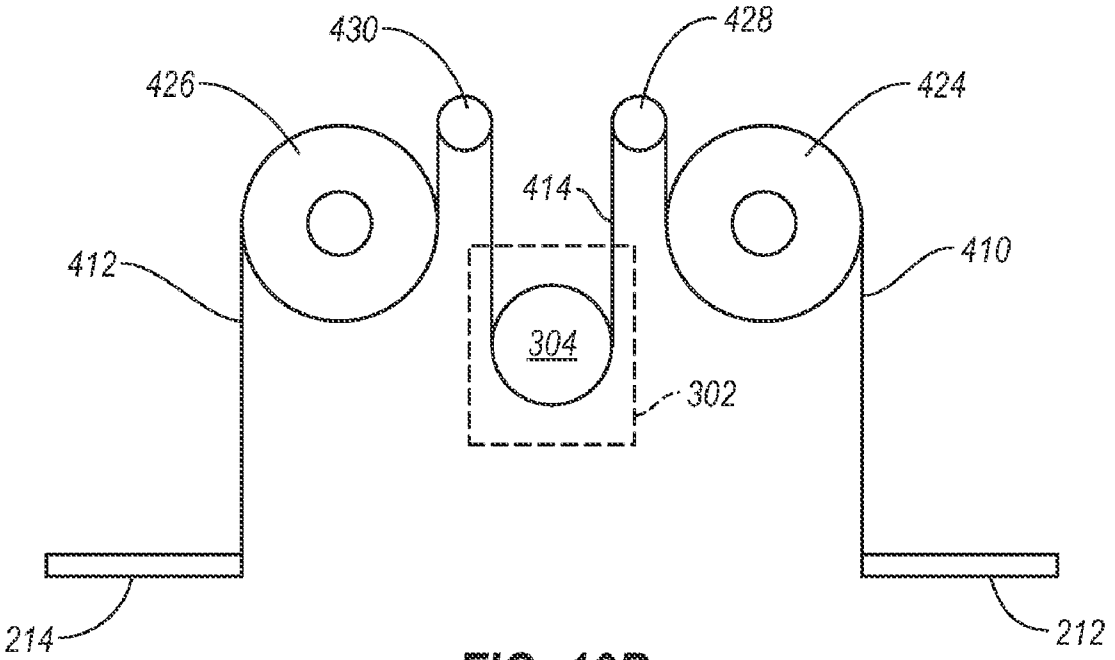


FIG. 10B

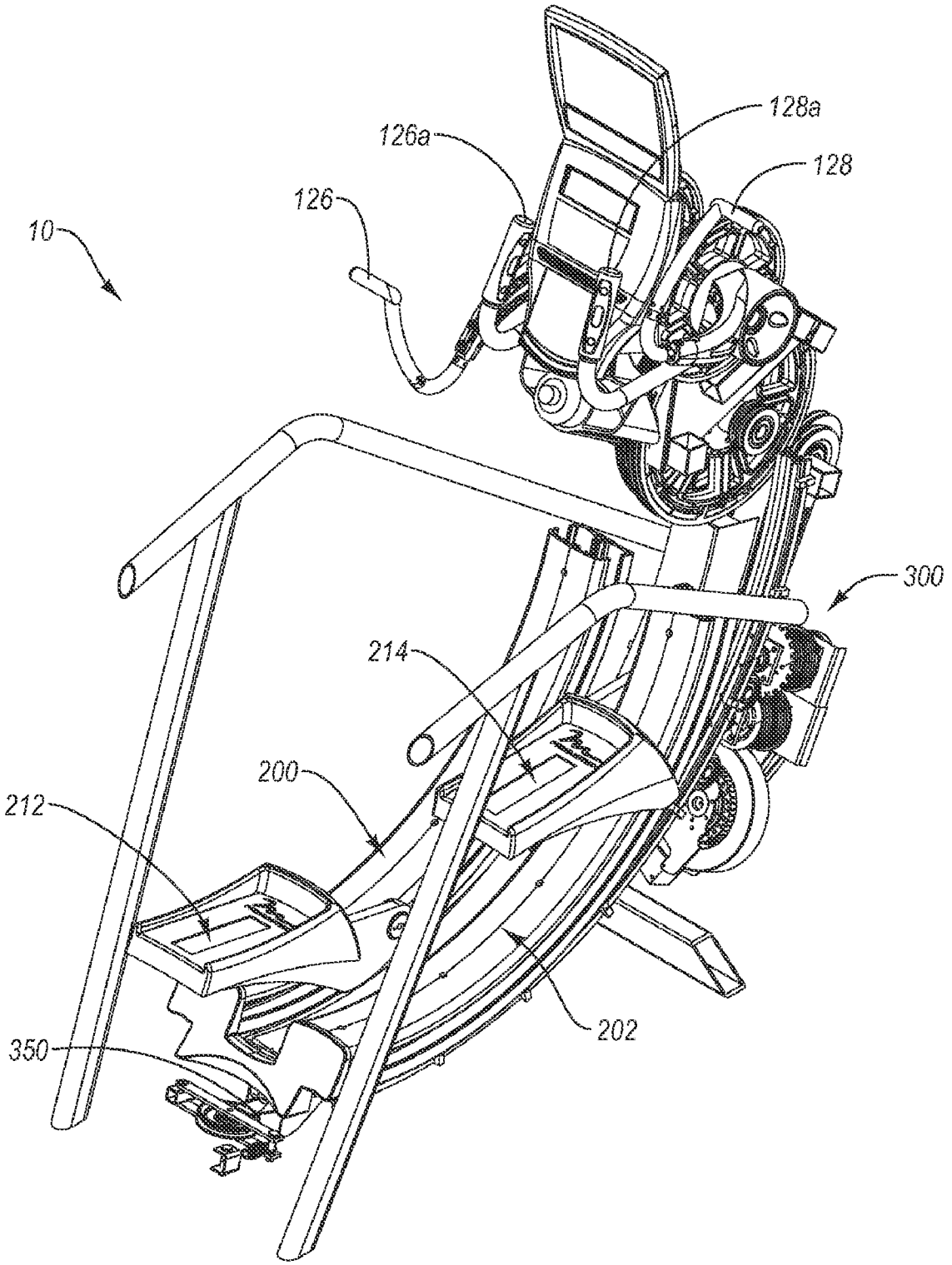
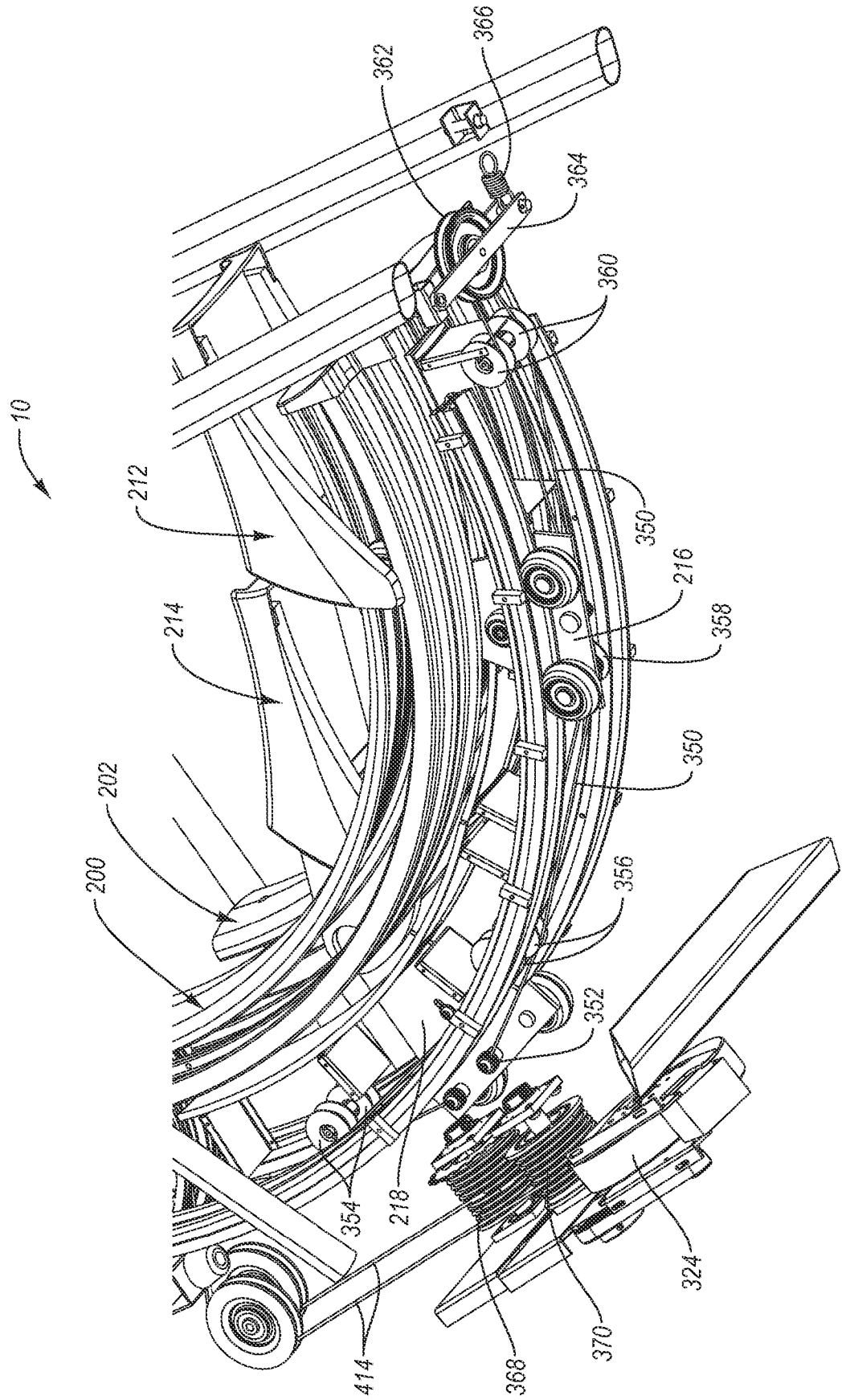


FIG. 11A


10
212
214
202
200
362
366
364
360
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216
358
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324
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368
414

FIG. 11B

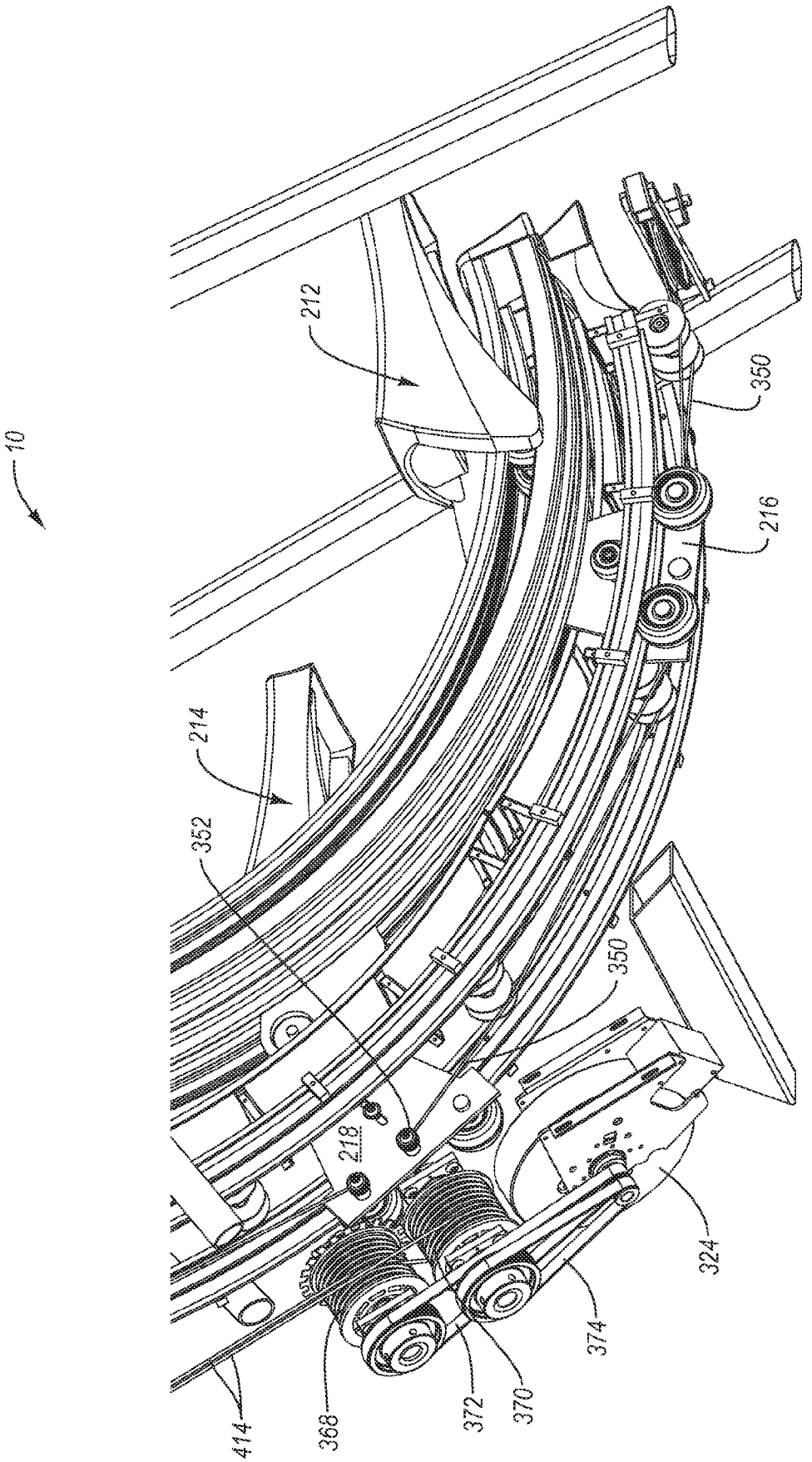


FIG. 11C

VARIABLE STRIDE EXERCISE DEVICE WITH RAMP

RELATED APPLICATIONS

The present application claims priority to and the benefit of U.S. Provisional Patent Application Ser. No. 60/834,928, filed Aug. 2, 2006 and entitled "EXERCISE DEVICE WITH PIVOTING ASSEMBLY, and U.S. Provisional Patent Application Ser. No. 60/908,915, filed Mar. 29, 2007 and entitled "VARIABLE STRIDE EXERCISE DEVICE WITH RAMP" the disclosures each of which are incorporated herein by reference in their entirety. United States Utility patent application Ser. No. 11/832,634, entitled "EXERCISE DEVICE WITH PIVOTING ASSEMBLY" with inventors Roy Simonson, William Dalebout, and Jaremy Butler filed Aug. 1, 2007, the same day as the filing date of the present application, is also incorporated herein, in its entirety by reference.

BACKGROUND OF THE INVENTION

1. The Field of the Invention

The present invention relates to exercise equipment. More particularly, the invention relates to a non-impact exercise device with a reciprocating motion.

2. The Relevant Technology

In light of the intense modern desire to increase aerobic activity, exercises including jogging and walking have become very popular. Medical science has demonstrated the improved strength, health, and enjoyment of life which results from physical activity.

Despite the modern desire to improve health and increase cardiovascular efficiency, modern lifestyles often fail to readily accommodate accessible running areas. In addition, weather and other environmental factors may cause individuals to remain indoors as opposed to engaging in outdoor physical activity.

Moreover, experience in treating exercise related injuries has demonstrated that a variety of negative effects accompany normal jogging. Exercise-related knee damage, for example, often results in surgery or physical therapy. Joints are often strained when joggers run on uneven surfaces or change direction. Other examples of common injuries resulting from jogging, particularly on uneven terrain, include foot sores, pulled muscles, strained tendons, strained ligaments, and back injuries.

As the population ages, there is a considerable need for exercise devices that have no impact on the joints. Hip and knee replacements are very expensive to the individual and to society in general. To the extent that joint replacements may be avoided, it is useful to have exercise devices that allow for an extreme workout without the potential strain imparted onto the load-bearing joints of the user.

There is a long standing need in the general area of exercise devices for a non-impact device with a reciprocating motion that approximates a variety of real world exercise movements. There are a variety of non-impact exercise devices that have a cyclical motion, such as elliptical trainers. Typical exercise devices often have a fixed stride length for exercise motion. With the same repetitive and unchangeable movement, the user is relegated to using the same sets of muscles to the detriment of other muscles. There is therefore a need for an exercise device that overcomes the disadvantages of typical exercise machines.

BRIEF SUMMARY OF THE PREFERRED EMBODIMENTS

The present invention is directed to a non-impact, striding exercise device capable of a variety of exercise motions and having a variable stride length. In one embodiment, the device includes a framework, at least one ramp assembly, a pair of foot support assemblies, a foot location control assembly coupled to the foot support assemblies so as to provide resistance against the user's movements, and means for adjusting a maximum stride length of the foot support assemblies. A user mounts the exercise device by stepping onto the foot platforms and holding onto the handles. The user is able to engage in a reciprocating, striding motion by putting force into the foot platforms and/or the handles. Movement of either the handles or the foot platforms causes the foot platforms to move along an associated ramp of the ramp assembly. The shape of the ramp(s) dictate the path of the exercise movement that the user experiences.

One advantage of the present invention is that the user is able to choose the length of their stride, which may be 30 inches or more. The present exercise device is designed so that it is easy for the user to enter into a linearly reciprocating motion without having to overcome the substantial inertia commonly experienced while reversing direction while using other reciprocating exercise devices, such as elliptical exercise devices. Elliptical exercise devices often use a crank and a heavy flywheel that combine to fix the path of the user's motion into a cycle that impels itself and makes it very difficult for the user to reverse direction. The present exercise device is designed such that the direction of the foot platform is easily reversed, slowed, or sped up with a minimal input of force from the user. This enables the user of the exercise device to be able to easily change their stride length from the infinitesimal all the way up to the user's maximum stride. The ability of the user of the exercise device to determine their own stride length is not only beneficial to users of different heights, but also allows the same user the flexibility to vary their workout on the exercise device by adjusting the length and frequency of the striding motion.

In addition, the present invention provides a non-impact exercise device that allows a user to simulate the exercise movements of elliptical or stair stepper motions, in a minimal amount of space. This combines a reduction in injury potential with a total body workout capability in a single exercise device. The upper portion of the ramp assembly is relatively vertical, corresponding to the movements of a stair stepper exercise, while the lower portion of the ramp assembly is relatively horizontal, corresponding more to the movements of an elliptical exercise. By adjusting the location of the foot supports, a user is easily able to work primarily at the upper end of the ramp assembly, at the lower end of the ramp assembly, or anywhere in between. In addition, the user is able to select their own desired stride length during an exercise routine, and change it accordingly at will without having to stop and adjust a mechanism.

The present exercise device may include a foot location control assembly to aid the user in selecting and maintaining a stride within a desired portion of the ramp assembly. The foot location control assembly is selectively adjustable by the user to effectively alter the upper and/or lower terminus of each foot support assembly. As mentioned, the foot location control assembly may be positioned so as to set upper termini

of the foot support assemblies so that user's stride motion is within a substantially horizontal portion of the ramp assembly. Alternatively, the foot location control assembly may be positioned so as to force the user to work within a substantially vertical portion of the ramp assembly, or anywhere in between.

The present exercise device is compact. In one preferred embodiment, the connection between the foot support assemblies, the handles, and the resistance assemblies are made via a flexible cable linkage, such that there are no rigid swinging arms or elbows. As such, the connecting cables are able to be contained within a substantially more compact exercise unit versus a swinging arm configuration that relies on connecting the upper and lower parts of the exercise machine via link arms and rods. Along with the overall simplicity and compactness of such a design, this feature helps to create an exercise device that is safer by eliminating the rigid swinging parts that have substantial momentum.

Another advantage of the present invention is that the user has unobstructed access to the exercise device. Certain exercise devices that have a reciprocal motion, such as purely elliptical devices, are enclosed by a bulky cage that surrounds the moving parts of the exercise device. Other devices having swinging members that arc out a large path through the operating space. Often times, such devices are only accessible through an opening in a cage-like frame assembly that surrounds the user interface of the elliptical exercise device. An advantage of the present exercise device is the ease of entry and simplicity of the design which allows a smaller footprint without having a relatively large cage-like frame assembly enclosing the moving parts of the exercise device. The lack of such a frame assembly allows the user of the exercise device to access the device from both the first and second sides as well as through the rear of the device.

These and other features of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

To further clarify the above and other advantages and features of the present invention, a more particular description of the invention will be rendered by references to specific embodiments thereof, which are illustrated in the appended drawings. It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. The invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

FIG. **1** is a side perspective view of an embodiment of the present invention depicting the foot platforms in a first configuration;

FIG. **2** is another perspective view of the exercise device of FIG. **1** depicting the foot platforms in a second configuration;

FIG. **3** is a rear view of the exercise device of FIG. **1**;

FIG. **4** is a side view of the exercise device of FIG. **1**;

FIG. **5** is another side view of the exercise device of FIG. **1**;

FIGS. **5**A, **5**B and **5**C are close-up views of a foot support assembly of the exercise device of FIG. **1**, for clarity, FIG. **5**C does not show the spring loaded drum pulley;

FIG. **5**D is a schematic representation of the movement of a foot support assembly upon a ramped surface of the exercise device of FIG. **1**;

FIG. **6** is a front view of an embodiment of the exercise device of FIG. **1** depicting an embodiment of the foot location control assembly;

FIG. **6**A is a view highlighting the resistance assembly and the foot location control assembly;

FIG. **7** is a perspective view depicting an embodiment of the exercise device of FIG. **1** having the spring loaded drum pulley of the foot support assemblies;

FIG. **7**A is a perspective view depicting an embodiment of an exercise device similar to FIG. **1**, but having a series of pulleys towards the rear of the exercise device, rather than having a spring loaded drum pulley;

FIG. **8** is a perspective view depicting the ramp assemblies of the exercise device of FIG. **1**;

FIG. **9** is a perspective view of an embodiment of the exercise device of FIG. **1**; depicting the linkage assembly;

FIG. **9**A is a close up perspective view showing several components related to the foot location control assembly of the exercise device of FIG. **1**; and

FIGS. **10**A and **10**B are schematic depictions of the variable positions of the foot location control assembly of the exercise device of FIG. **1**; and

FIGS. **11**A-**11**C illustrate an alternative embodiment of the exercise device of the present invention in which cable tension within the linkage system is maintained by a lower cable and pulley assembly rather than a spring loaded drum pulley as described in previous Figures.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

I. Introduction

The exercise device of the present invention is a non-impact, striding exercise device that enables a variety of exercise movements. An exercise device **10** comprises (i) a framework **100**, (ii) a pair of spaced apart ramp assemblies **200**, **202**, (iii) a pair of spaced apart foot platform assemblies **212**, **214**, (iv) a foot location control assembly **300**, (v) and a linkage assembly **400** (FIGS. **9**-**10**B).

A user mounts exercise device **10** by stepping on top of first foot support assembly **212** and second foot support assembly **214**. Foot platform assemblies **212**, **214** roll upon a pair of spaced apart ramp assemblies **200**, **202**. The path that the user's feet travel is defined by first and second spaced apart foot platform assemblies **212**, **214** as they roll along respective underlying first and second ramp assemblies **212**, **214**. As will be discussed later, through changing the position of foot location control assembly **300**, the user of exercise device **10** may vary the exercise motion from a substantially elliptical motion, to a substantially stair-stepping motion.

The user moves spaced apart foot platform assemblies **212**, **214** in a reciprocating manner in a variety of exercise planes defined by the length and shape of spaced apart ramp assemblies **200**, **202**. A user's exercise stride length may be all the way from very small movements (e.g., 0 to about 3 inches) to very large movements (e.g., more than 30 inches, even as high as 44 inches, for example, or more), and any increment therebetween. As will be discussed later, the design of ramp assemblies **200**, **202** enables foot platform assemblies **212**, **214** to remain at an ergonomically favored angle throughout the user defined exercise stride.

II. Framework

Framework **100** supports ramp assemblies **200**, **202**, and foot location control assembly **300** all within a relatively narrow footprint. This allows easy access to exercise device **10** rather than having a "cage" surrounding the device that makes access inconvenient.

Turning now to the drawings, FIGS. **1**-**10**B refer to embodiment **10** of the exercise device that has a reciprocally

dependent movement of spaced apart handlebars **126**, **128** and spaced apart foot platform assemblies **212**, **214**. Spaced apart foot platform assemblies **212**, **214** move upon spaced apart ramp assemblies **200**, **202**. A user may define their exercise quality through foot location control assembly **300**, which is coupled with the movement of spaced apart foot assemblies **212**, **214** and spaced apart handlebars **126**, **128**, through flexible linkage assembly **400**.

FIG. **1** is a perspective view of exercise device **10**. Framework **100** comprises a first side panel **102** (partially cut away), a second side panel **104** (cut away from FIG. **1** for clarity, shown later in FIG. **5**), an upright gusset **106**, a bottom gusset **108**, a front stabilizer member **114**, a rear stabilizer member **116**, a first hand rest **118**, a second hand rest **120**, a first rear support **122** for supporting hand rest **118**, and a second rear support **124** for supporting hand rest **120**. First and second ramp assemblies **200**, **202** are mounted at a front end to upright gusset **106** and at a rear end to rear stabilizer member **116**.

First side panel **102** and second side panel **104** are substantially vertical and parallel to one another. First side panel **102** is connected at or near one end to upright gusset **106** and at or near a bottom end to bottom gusset **108**. Second side panel **104** is attached to opposite sides of upright gusset **106** and bottom gusset **108**. Upright gusset **106** is connected to bottom gusset **108** in an essentially perpendicular configuration. First guide rail **110** and second guide rail **112** are bolted or otherwise fastened to the interior of first side panel **102** and second side panel **104**, respectively. As will be discussed later, first guide rail **110** and second guide rail **112** run in a substantially vertical direction, may be essentially parallel to upright gusset **106** and act to guide the movement of foot location control assembly **300**.

Front stabilizer member **114** is perpendicularly fixed to the front lower portions of first and second side panels **102**, **104**. Rear stabilizer member **116** is perpendicularly fixed to the rear lower portions of first and second side panels **102**, **104**. Together, front and rear stabilizer members **114**, **116**, rest upon a support surface such as a floor and help to stabilize exercise device **10**.

To help stabilize the user of exercise device **10**, framework **100** may contain first and second spaced apart hand rests **118**, **120**. The front end of first and second spaced apart hand rests **118**, **120** may respectively be connected to first and second spaced apart side panels **102**, **104**. First and second spaced apart hand rests **118**, **120** are further supported by first and second spaced apart rear supports **122**, **124**. A user of exercise device **10** may use hand rests **118**, **120**, for example when they become fatigued from using exercise device **10** or simply as an alternative to handle bars **126**, **128**. In another embodiment, a pair of additional stationary handle bars **126***a* and **128***a* may also be provided near and at approximately the same height as handle bars **126**, **128** (e.g. see FIG. **11**A).

FIG. **2** depicts a perspective view of exercise device **10** with foot platform assemblies **212**, **214** in an orientation opposite that depicted in FIG. **1**.

FIG. **3** depicts a rear perspective view of exercise device **10** showing the easy accessibility that a user has to exercise device **10**, as well as the overall narrow profile of exercise device **10**.

FIG. **4** depicts a side perspective view of exercise device **10** showing the overall configuration of framework **100**, ramp assemblies **200**, **202**, foot platform assemblies **212**, **214**, and foot location control assembly **300**. As will be discussed later, FIG. **4** also depicts a front cable attachment **217** to linkage assembly **400**.

III. Ramp Assembly

FIG. **5** depicts exercise device **10** from a side perspective, highlighting spaced apart ramp assemblies **200**, **202** and spaced apart foot platform assemblies **212**, **214**. Each of spaced apart ramp assemblies **200**, **202** have an upper ramp **204**, **206** as well as a respective lower guide tube member **208**, **210**. Each upper ramp **204**, **206** follow the same arc or curve. Each lower guide member **208**, **210** follow the same arc or curve. Each spaced apart ramp assembly **200**, **202** is attached to upright gusset **106** at a front end and to rear stabilizer member **116** at a rear end.

Spaced apart foot platform assemblies **212**, **214** each include a respective foot platform **211**, **213** and respective foot platform brackets **216**, **218**. Foot platforms **211**, **213** are pivotally attached at their respective front ends to the top ends of respective foot platform brackets **216**, **218**. First and second spaced apart foot platforms **211**, **213** may have an overall perpendicular orientation to respective foot platform brackets **216**, **218** when the assembly is near the lower portion of the ramp assembly, and a substantially parallel orientation relative to the associated bracket when the assembly is near the upper portion of the ramp assembly, as shown in FIG. **5**.

Spaced apart foot platforms **211**, **213** rest upon respective upper ramps **204**, **206** by respective upper ramp wheels connected to the bottom of each respective foot platform **211**, **213**. For clarity, only upper ramp wheel **220** of foot support assembly **212** is shown in FIG. **5**, although it will be understood that foot support assembly **214** may be an identical or similar mirror image thereof.

FIGS. **5**A, **5**B and **5**C further depict the foot platform assemblies. Foot platform bracket **216** is coupled to lower guide member **208** by foot platform bracket upper wheel **224**, which rolls along a top surface of lower guide member **208**. Bracket **216** further includes a pair of lower wheels **228**, **230** to securely couple the foot support assembly **212** to lower guide member **208** of ramp assembly **204**.

Therefore, spaced apart foot platform brackets **216**, **218** are movably fixed to roll along respective spaced apart lower guide members **208**, **210** because of the configuration of their respective first and second foot platform bracket upper wheels **224**, **226** and respective lower wheels **228**, **230** which "sandwich" respective first and second lower guide members **208**, **210** between the wheels.

FIG. **5**D depicts a schematic representation of the movement of a foot support assembly along a ramp assembly. In an embodiment of exercise device **10**, each first and second lower guide member **208**, **210** may advantageously be a different length and a different arc or curve relative to respective upper ramps **204**, **206**. In one embodiment, upper ramps **204** and **206** form arcs (i.e., representing a portion of a circle) having a first radius, and the lower guide members **208** and **210** forming arcs having a second, different (e.g., larger) arc radius. For example, ramps **204** and **206** may include a curvature radius of about 31 inches, while guide members **208** and **210** include a curvature radius of about 38 inches. These different curvatures help maintain a desired pedal orientation during movement of the foot platform assemblies along the ramps and guide members. Such a configuration results in an exercise device **10**, is shown in FIG. **5**D where each lower guide member **208**, **210** is separated from its respective upper ramp **204**, **206** by a larger distance D**2** at their respective front ends than the distance D**1** of separation at their respective rear ends, as depicted in FIG. **5**D. Since foot platforms **211**, **213** roll along upper ramps **204**, **206** and since foot platform brackets **216**, **218** roll along lower guide members **208**, **210**, the top end of each foot support assembly **212**, **214** travels a different path than does the bottom end of each foot support

assembly **212**, **214**. Alternative embodiments may include other types of curves (e.g. an elliptical-like curve representing a portion of an ellipse, an exponential type curve, or other curve).

The different paths that the top and bottom ends of foot platform assemblies **212**, **214** travel, coupled with the pivoting attachment of the front of the foot platforms **211**, **213** to the top of foot platform brackets **216**, **218**, can impart an articulation upon foot platforms **211**, **213** throughout the travel of the foot platform assemblies **212**, **214** as they travel along ramp assemblies **200**, **202**. In one embodiment, this articulation, as shown in FIG. **5**D, for example, results from the movement of the bracket upwardly with respect to the foot platform **211**, and causes foot platform **211** to pivot slightly as it moves from a lower position to an upper position, but to still remain substantially parallel to a support surface. The amount of movement of foot platform **211** can be readily adjusted as desired by adjusting the curvature of upper ramp **204** and/or lower guide member **208**.

In another embodiment of exercise device **10**, which is not depicted, there may be a single, continuous upper ramp instead of first and second spaced apart upper ramps **204**, **206**. In another embodiment of exercise device **10**, spaced apart first and second foot platforms **211**, **213** may each rest upon a single upper ramp wheel instead of each platform resting on a pair of upper ramp wheels **220** (i.e., one on either side of upper ramp **204**).

As mentioned, ramp assemblies **200**, **202** may be of any arced or curved shape such that the path foot platform assemblies **212**, **214** travel along respective ramp assemblies **200**, **202** may be a range of curved shapes. The shapes of the curves are dependent upon what kind of movement/workout the device is intended to deliver and/or the user wants. The human body's natural hip, knee and ankle movements may be factored into the design of ramp assemblies **200**, **202**. The movement of the joints throughout the stride can be engineered to conform to the natural motion of the hips, knees and ankles such that awkward, painful and unnatural angles are avoided.

One configuration provides upper ramps **204** and **206** which comprise a first arc representing a portion of a circle having a first one radius, and the lower guide members **208** and **210** also comprise an arc representing a portion of a circle, but of a larger radius. Such a configuration has been found to provide for a natural body motion relative to the hips, knees, and ankles during exercise. For example, as shown in FIG. **4** and FIG. **5**D, such a configuration of ramp assemblies **200** and **202** can result in an articulation of the foot platform (e.g., see foot platform **211**) which angles the user's toes upwards near the top portion of the ramp assembly at about 1° to about 5° (e.g., 2°). Similarly, when the foot platform (e.g. see foot platform **213**) is near the bottom portion of the ramp assembly, the user's toes can be angled downward at about 5° to about 15° (e.g., 10°). Other articulations of the foot platforms and foot support assemblies are possible simply by altering the configuration of the upper ramps **204**, **206** and/or the lower guide members **208**, **210**, for example by changing the radii of one or both components. Changes in articulation may also be accomplished by altering the configuration of the foot platform brackets **216**, **218** which couple the foot support assemblies to the ramp assemblies.

The movement of foot platform assemblies **212**, **214** may comprise two strokes, a power stroke and a return stroke. The power stroke is the movement when foot platform assemblies **212**, **214** impart energy into braking device **324**, depicted in FIGS. **6** and **6**A. The return stroke is the opposite movement and may not impart energy into braking device **324**. The power stroke correlates to the downward motion of foot platform assemblies **212**, **214**.

Braking device **324** is also a flywheel, storing angular momentum as the exercise device is being used. Braking device **324** may be used as a brake in order to retard the rotation of the drive pulley assembly. Braking device **324** may be an eddy brake. In an embodiment, braking device **324** is responsible for generating the current necessary to power the display and computer of the exercise device.

Another advantage of the present invention over the prior art is that exercise device **10** has a variable stride length. The overall stride length may be varied from a barely perceptible movement all the way out to the limit of the lengths of ramp assemblies **200**, **202**. The stride length is measured along the arc length of the ramp. In some embodiments of the exercise device, the user's stride may be at least about 30 inches measured along the arc length of the ramp. In one embodiment, the stride length is at least about 35 inches. In another embodiment the stride length is at least about 40 inches. In yet another embodiment, the stride length is at least about 44 inches. The stride length can be more. The length of the stride is limited by the length of ramp assemblies **200**, **202**. The stride length can also be limited by the cabling of the resistance assembly. The advantages of having a large and variable range of motion will be appreciated by any user of exercise devices. Users of different heights can determine what the comfortable range of motion is for them. A user is not limited to a "one size fits all" reciprocating device where the path of the movement is fixed. The infinitely variable stride length allows a user of any height to get a complete range of motion while using exercise device **10**. When the foot location control assembly **300** is near its middle position, the user may use the entire length of ramp assemblies **200**, **202** create a full range of motion in order to increase the difficulty of the striding motion, and for a more complete stretch of the tendons, ligaments and muscles of the legs.

If the user wants to work at a higher frequency with a smaller stride length, the user can change the stride motion by changing the force put in through foot platform assemblies **212**, **214** and/or handles **126**, **128**.

Elliptical exercise devices commonly have a crank that fixes the motion as well as a flywheel that makes changing the direction of the motion difficult. The user of an elliptical device is typically limited to movement within the elliptical cycle of motion prescribed by the crank. The user of a typical elliptical device must overcome the substantial inertia of the flywheel in order to change direction. Because exercise device **10** of the present invention has linkage system **400** and foot location control assembly **300** coupled to movement of foot platform assemblies **212**, **214** along ramp assemblies **200**, **202**, the user is in control of the quality and type of exercise motion they want to experience. Unlike a devoted stair stepper or elliptical device, the stride length of the present exercise device is not predefined nor is the quality of the exercise movement unchangeable.

An additional benefit of the present invention is that it is substantially more compact than other exercise devices on the market. FIG. **4** depicts the long potential stride length relative to the overall longitudinal footprint of exercise device **10**. Ramp assembly length, and therefore the possible stride length, may be as much as around 50% of the overall length of exercise device **10**, for example. The amount of movement that the user experiences is very large compared to the small lengthwise footprint of the exercise device.

FIG. **2** also depicts the narrow horizontal footprint of the exercise device. Compared to other exercise devices that have

a bulky, cage-like enclosure around their moving parts, the present exercise device is narrow. Since framework **100** is substantially the same width as the moving portions of exercise device **10**, the overall footprint of exercise device **10** is substantially smaller than other devices on the market. For example, in typical elliptical exercise devices, the moving parts of the exercise device are within a large cage-like frame assembly that prevents the device from falling over.

A further advantage of the current exercise device is that the size, and hence the footprint on the support surface, is substantially contained within the moving parts of the device, and vice versa. This decreased footprint offers substantial benefits to both the home user and the commercial user. The present exercise device takes up less space in the home of the user as well as increasing the amount of floor space available in a commercial gym that offers the present exercise device instead of other devices.

The movement of foot platform assemblies **212**, **214** and handlebars **126**, **128** can duplicate a movement that is essentially the natural gait of a walking person. While the user of the present exercise device is standing upon foot platform assemblies **212**, **214**, they may put exercise device **10** into motion by imparting a force through handlebars **126**, **128** and/or foot platform assemblies **212**, **214**. For example, when a user stands upon foot platform assemblies **212**, **214** and grabs handlebars **126**, **128** and moves their second foot in a forward direction, the first foot will move rearward, the user's first hand will move in a forward direction, and the user's second hand will move in a rearward direction. In this way, the movement of foot platform assemblies **212**, **214** and handlebars **126**, **128** may be reciprocally related to one another.

In some exercise devices such as a typical elliptical exercise device, there is a significant amount of momentum associated with the movement of the crank and foot supports. The angular momentum conserved in the motion of the foot platforms of elliptical devices makes it is easier to maintain movement in the elliptical pattern as determined by the crank. For the user who wants to frequently change the direction of the elliptical motion, the substantial momentum of the flywheel makes it very difficult to change direction. A significant amount of force must be put into an elliptical device in order to change the direction from clockwise to counterclockwise, or vice versa.

An advantage of the present exercise device is that the user may easily change the length and frequency of the reciprocal stride with only a minimal input of force. The exercise device of the present invention has a movement that is reciprocating in nature, but it is not limited to the path created by a crank, nor is it inseparably tied to the momentum created by a flywheel. In order to reciprocate their stride, the user of the exercise device need only to move their foot/hand in an opposite direction with a force commensurate with changing the movement of the foot/hand during a normal walking or running gait. In contrast, the user of an elliptical device must strain to put in enough force to change the direction of rotation of the flywheel/crank/foot platform apparatus. Thus, the present exercise device offers a non-impact, natural-gait movement and requires input forces commensurate with the natural movement of walking or running.

The exercise device of the present invention contains braking device **324** (see FIGS. **6** and **6**A) that acts as a flywheel, storing momentum imparted upon it during the power stroke. During the power stroke, force from the user is put into the exercise device by means of their weight, leg muscles and/or arm muscles. Braking device **324** and the drive pulley assembly only spin in one direction. Braking device **324** acts as a flywheel and stores inertia in order to facilitate the start of the power stroke. The inertial momentum of braking device **324** does not affect the minimal force necessary to change the reciprocal movement of foot platform assemblies **212**, **214**. It is only during the power stroke that braking device **324** is engaged and during which energy is imparted into braking device **324**. On the return stroke of either foot support assembly **212**, **214**, one of the drive pulleys of the drive pulley assembly spins freely and does not affect the rotation of braking device **324**. Since there is very little resistance during the return stroke, and because braking device **324** is acting as a store of inertia for the power stroke, only a small amount of force is necessary to initiate the reciprocal movement of exercise device **10**.

IV. Foot Location Control Assembly

FIGS. **6**-**9**A are a series of perspective views of exercise device **10**, depicting foot location control assembly **300** and linkage assembly **400**. FIGS. **6** and **6**A are a front perspective view of exercise device **10** depicting foot location control assembly **300**. Foot location control assembly **300** moves along a substantially vertical plane defined by the area in between first and second guide rails **110**, **112**. The upper and lower limit of travel available to foot location control assembly **300** are defined by the lengths of first and second guide rails **110**, **112**.

Foot location control assembly **300** includes a capstan **304** mounted to a pulley sled **302**. Pulley sled **302** is a frame on which capstan **304** and other components are mounted, and which selectively moves up and down along guide members **110**, **112** to adjust a foot location of foot support assemblies **212**, **214**.

Capstan **304** may also be a drum pulley or other pulley or winch capable of winding or unwinding a length of cable. In an embodiment of exercise device **10**, capstan **304** may be coupled via a flexible linkage, such as a cable, to a resistance assembly, e.g. to a one-way clutch **312**, a first drive pulley **314**, a second drive pulley **316**, and a braking device **324**, as depicted in FIGS. **9** and **9**A. As will be discussed later, the pulleys and capstan of foot location control assembly **300** as well as other moving parts of exercise device **10** (e.g., foot support assemblies **212**, **214**, handles **126**, **128**, first and second drive pulleys **314**, **316**) are connected to one another by a flexible linkage mechanism having components described in linkage assembly **400**.

Foot location control assembly **300** is mounted to guide rails **110**, **112** by means of a front mounting plate **326**, a rear mounting plate **328** (FIGS. **7**, **7**A, and **9**A), a first side plate **330**, and a second side plate **332** which collectively form pulley sled **302** to which a variety of components of the foot location control assembly are mounted. In another embodiment of exercise device **10**, the resistance assembly is independently located from pulley sled **302**.

Pulley sled **302** is movably connected to first guide rail **110** on a first side through a first pair of slide bearings **334**. Drive pulley sled **302** is movably connected to second guide rail **112** on a second side through a second pair of slide bearings **336**. One of slide bearings **334** and one of slide bearings **336** are mounted at the top end of each side plate **330**, **332** and one of slide bearings **334** and one of slide bearings **336** are mounted at the bottom end of each side plate **330**, **332**.

In the illustrated exemplary embodiment of exercise device **10**, a capstan main shaft **306** (FIGS. **7**, **7**A and **9**A) is mounted through rear mounting plate **328** and through rear bearing mount plate **338** (FIG. **7**), through front mounting plate **326** and through front bearing mount plate **338** (FIG. **9**). Capstan main shaft **306** is connected to a rear end of one-way clutch

312, which includes a pressed-in one way clutch so as to accept rotation in only one direction, and also includes a series of evenly spaced gear teeth around its circumference (FIG. 9A). First one way clutch **312** is connected on its front side to a rear end of first clutch shaft **308**. First clutch shaft **308** then ends at its front end by being mounted through first drive pulley **314**.

Second drive pulley shaft **318** is mounted through rear mounting plate **328** through lower rear bearing mount plate **340**, through front mounting plate **326** and through lower front bearing mount plate **341**. Second drive pulley shaft **318** is mounted to a second drive pulley shaft gear **343**, which includes a series of evenly spaced gear teeth that mesh with the evenly spaced teeth of first clutch gear **312**. Second drive pulley shaft **318** ends at its front end by being mounted through second drive pulley **316**.

In operation, the user moves foot support assemblies **212** and **214** up and down ramp assemblies **200** and **202**. During each the power stroke of each respective foot support assembly, capstan **304** alternates between a clockwise and counterclockwise direction. Geared one-way clutch **312** includes a pressed-in one way clutch to allow it to rotate in only one direction (e.g. counterclockwise). First drive pulley **314** also includes a pressed-in one way clutch to allow it to rotate in only one direction, which is opposite that of geared one-way clutch **312** (e.g. clockwise). The teeth of geared one-way clutch **312** are coupled to gear **343**, which causes gear **343** to spin in a direction opposite geared one-way clutch **312**. Gear **343** is mounted on shaft **318**, on which is also mounted second drive pulley **316**. As such, the rotational inertia from one-way clutch **312** is reversed in direction by gear **343**, and then used to drive second drive pulley **316**, which in turn drives braking device **324**. Such a configuration delivers all rotation inertia to braking device **324** in a single rotational direction.

First drive pulley **314** and second drive pulley **316** together form a drive assembly that drives braking device **324**. Both first drive pulley **314** and second drive pulley **316** rotate in the same direction. The drive assembly imparts a one-way rotation upon a braking device shaft **322** that allows braking device **324** to spin in only one direction. First drive pulley v-belt **432** (FIGS. **9** and **9**A) is connected at one end to first drive pulley **314** of foot location control assembly **300** and at a second end to braking device shaft **322**. Second drive pulley v-belt **434** is connected at one end to second drive pulley **316** of foot location control assembly **300** and at a second end to braking device shaft **322**.

A lead screw **342**, an electric motor **344** and an actuator bracket **346** collectively form the actuator assembly that is responsible for moving foot location control assembly **300**. Lead screw **342** is mounted at its bottom end to electric motor **344**. Lead screw **342** is mounted at a position along its length to actuator bracket **346** which is mounted to rear mounting plate **328** of pulley sled **302**. Actuator bracket **346** is threaded along its connection with lead screw **342** such that a rotation imparted upon lead screw **342** by electric motor **344** in either direction imparts an upward or downward movement of actuator bracket **346** and thus and upward or downward movement of foot location control assembly **300** as assembly **300** slides within guide rails **110**, **112**. Movement could alternatively be forward/rearward, depending on the mounting orientation of the foot location control assembly. By moving assembly **300** in one direction, the location of foot support assemblies **212**, **214** is moved either upwards or downwards along respective ramp assemblies **200**, **202**, as will be discussed in further detail below.

V. Linkage Assembly

FIG. **9** is a perspective view of exercise device **10** that shows linkage assembly **400**. Linkage assembly **400** may advantageously comprise a flexible linkage mechanism, for example, a series of pulleys and flexible links such as one or more cables that link the movement of handlebars **126**, **128**, through the foot location control assembly **300** to foot platform assemblies **212**, **214** as they move along ramp assemblies **200**, **202**. The term cable is meant to include other elongate flexible linkages such as belts, chains, and ropes, for example.

Linkage assembly **400**, as depicted in FIGS. **4** and **9**, includes a first rear cable **402** and a second rear cable **404**. For clarity, first rear cable **402** is only depicted in FIG. **4**, but it is understood to be part of linkage assembly **400**, which is further depicted in FIGS. **9**, **9**A, **10**A and **10**B. Each of first and second rear cables **402**, **404** is fixed at one end to the framework **100** (e.g., rear stabilizer **116**). Each of first and second rear cables **402**, **404** is fixed at an opposite end to, respectively, a spring loaded drum pulley **406**, **408** which form part of foot support assemblies **212**, **214** respectively. First and second spring loaded drum pulleys **406**, **408** are respectively connected to first and second foot platform brackets **216**, **218**. When first and second foot platform assemblies **212**, **214** move along respective first and second ramp assemblies **200**, **202**, the length of cable wound upon first and second spring loaded drum pulleys **406**, **408** changes. When first foot support assembly **212** or second foot support assembly **214** is at its maximum forward position, the amount of wound cable upon respective first and second spring loaded drum pulleys **406**, **408** is at its minimum. When first foot support assembly **212** or second foot support assembly **214** is at its maximum rearward position, the amount of wound cable upon respective first and second spring loaded drum pulleys **406**, **408** is at its maximum. Cables **402**, **404** can provide a desired amount of tension and/or resistance to linkage assembly **400** and/or movement of foot support assemblies **212**, **214** and/or can help ensure a smooth, stable and consistent exercise motion.

As depicted in an embodiment of exercise device **10** in FIG. **7**A, rather than employing rear cables **402**, **404**, a single rear cable **466** is connected to the rear end of each foot support assemblies **212**, **214**. Single rear cable **466** is connected to the rear end of a first foot support assembly **212**, passes through a first rear transverse pulley **462**, a middle rear transverse pulley **460**, and a second rear transverse pulley **464**, then connects to the rear end of a second foot support assembly **214**.

A first front cable **410** and a second front cable **412** (see FIGS. **9** and **10**A-**10**B) are attached at their respective rear ends to the front side of respective foot platform brackets **216**, **218** at the front cable attachments to each of foot platform brackets **216**, **218**. For example, front cable attachment **217** is depicted on foot platform bracket **218** in FIG. **4** (the respective front cable attachment for foot platform bracket **216** is not depicted). A first front cable **410** and a second front cable **412** are attached at their respective opposite ends to a first groove **436** of a first large drive pulley **424** and a first groove **440** of a second large drive pulley **426**.

The first end of a capstan cable **414** is attached to a second groove **438** of a first large drive pulley **424**. Capstan cable **414** is then routed through a first transverse pulley **428** that guides capstan cable **414** onto capstan **304** of foot location control assembly **300**. Capstan cable **414** wraps around capstan **304**. Capstan cable **414** then travels through a second transverse

pulley **430** and is directed into a second groove **442** of second large drive pulley **426**, where the second end of capstan cable **414** is fixed.

First handle bar **126** is fixed to a first handle bar pulley **416** at an ergonomically beneficial angle. Second handle bar **128** is likewise fixed to a second handle bar pulley **418** at an ergonomically beneficial angle. A first handle bar flexible linkage (e.g. cable **420**) is connected at one end to first handle bar pulley **416** and at another end to first large drive pulley **424**. Likewise, a second handle bar flexible linkage (e.g., cable **422**) is connected at one end to a second handle bar pulley **418** and at another end to a second large drive pulley **426**.

FIGS. **10**A and **10**B depict a schematic of the movement of capstan **304** and pulley sled **302** and the effect on the front terminus of movement of foot platform assemblies **212**, **214**.

The effect of varying the length of unwound cable between front cables **410**, **412** and capstan cable **414** is to vary the termini of travel of foot platform assemblies **212**, **214** along ramp assemblies **200**, **202** and to thereby vary the stride length of foot support assemblies **212**, **214**. The amount of unwound cable between front cables **410**, **412** and capstan cable **414** is adjusted through the raising and lowering of foot location control assembly **300**. As depicted schematically in FIG. **10**B, when pulley sled **302** (dotted-in for clarity) and capstan **304** of foot location control assembly **300** are at their maximum height relative to the supporting surface, the fixed length of the cables allows the lower terminus of movement of each of foot platform assemblies **212**, **214** along ramp assemblies **200**, **202** to be at its most rearward position along ramp assemblies **200**, **202**. In this position, as depicted in FIG. **10**B, the exercise motion imparted upon a user is more like that of a classical elliptical machine, as the user's exercise motion is primarily along the horizontal aspect of ramp assemblies **200**, **202**.

As depicted schematically in FIG. **10**A, when pulley sled **302** (dotted-in for clarity) and capstan **304** of foot location control assembly **300** are at their minimum height relative to the supporting surface, the fixed length of the cables forces the lower termini of movement of foot platform assemblies **212**, **214** along ramp assemblies **200**, **202** to be at a position which is higher relative to the configuration shown in FIG. **10**B. In this position, as depicted in FIG. **10**A, the exercise motion imparted upon a user is more like that of a stair-stepper exercise machine. The user's exercise motion is primarily along the vertical aspect of ramp assemblies **200**, **202**. Motion of pulley sled **302** either up or down adjusts the effective length of the cable so as to adjust the maximum achievable stride length of the foot support assemblies. When pulley sled **302** is positioned at a minimum height, the cable linkage mimics that of a shorter cable compared to if the pulley sled is positioned upward of this minimum height position. This adjustment feature of the pulley sled **302**, capstan **304** and the cable **414** alters the effective length of the cable.

Thus foot location control assembly **300** enables exercise device **10** to operate more like an elliptical exercise device and/or to operate more like a stair-stepper device as desired by the user. Foot location control assembly **300** and/or the resistance assembly described herein can be selectively controlled, for example through the use of a user controlled console and associated electronics mounted on framework **100**.

Foot location control assembly **300** described in conjunction with FIG. **6**-**10**B is an example of an adjustment assembly for adjusting the neutral body position of the user of the exercise device with respect to a support surface. As such, foot location control assembly **300** is an example of means for adjusting the neutral body position of the user of the exercise device with respect to a support surface. Thus, one example of means for adjusting the neutral body position of a user may comprise a foot location control assembly (e.g. a capstan **304** mounted on a pulley sled **302** and a lead screw **342**, electric motor **344**, and actuator bracket **346** as described above for assisting in moving pulley sled **302** along guide rails **110**, **112**). Another example of means for adjusting the neutral body position of the user of the exercise device with respect to a support surface is a lead screw that may be used independent of a pulley sled. Another example of means for adjusting the neutral body position of the user of the exercise device with respect to a support surface is an adjustable pulley system that may similarly be used independent of a lead screw that may be used to alter the orientation of the foot platforms of assemblies **212**, **214**, thereby adjusting the neutral body position of the user. For example, capstan **304** and pulley **414** can be configured so as that more or less of the length of cable **414** is wound around capstan **304** so as to move foot platforms of assemblies **212**, **214** upward or downward along ramps **200**, **202**, adjusting the neutral body position of the user of the exercise device relative to a support surface. In another example an adjustable pulley system may be adjustably moveable with respect to framework **100**, such that when the pulley is moved upward or downward along the framework the position of the foot platforms of assemblies **212**, **214** move with respect to the framework **100**, thereby adjusting the neutral body position of the user of the exercise device with respect to a support surface. Other examples of means for adjusting the neutral body position of the user of the exercise device with respect to a support surface include, but are not limited to, gear assemblies, hydraulic assemblies, an elastic resistance assemblies, and the like.

The neutral position of the present exercise device is a position in which the foot platforms **211**, **213** are disposed laterally adjacent to one another (i.e., neither is "ahead" or "behind" the other). When the exercise device is in the neutral position, the user's body is in the neutral body position. The user's body may experience a variety of different positions depending upon how the neutral body position is adjusted. For example, changing the neutral body position may vary the muscles worked and/or intensity of the workout. Different body positions impart different characteristics to the exercise movement of the present exercise device. For example, a user may place more of a burden on their arms or legs, respectively, by adjusting the neutral body position.

FIGS. **11**A-**11**C illustrate an alternative embodiment of the exercise device of the present invention in which cable tension within the flexible linkage system may be maintained by a lower cable and pulley assembly (e.g., rather than or in addition to the spring loaded drum pulley and/or rear cable described previously). In addition, the embodiment illustrated in FIGS. **11**A-**11**C is illustrated as not including a foot location control assembly which is vertically adjustable, but rather in which the components which perform the function of the pulley sled components described in the other embodiments are fixed (i.e., not vertically adjustable so as to alter the neutral position of the foot platform assemblies). Such an embodiment may be less complex and although it may not offer the full range of adjustments as the embodiments described above, such an embodiment also may have reduced cost, so as to be more suitable for home use.

As perhaps best seen in FIGS. **11**B-**11**C, a single lower cable **350** maintains tension on the cables of the flexible linkage system and on the foot platform assemblies during movement of the foot platform assemblies. One end of cable

350 is attached to an inwardly oriented surface of bracket 218 through, for example, extension spring 352 and an associated pivoting transverse mount. The inclusion of extension spring 352 aids in absorption of forces applied to the cable linkage as a result of the reciprocal movement of foot platforms 212, 214, as well as to minimize cable slack within the linkage system. The second end of cable 350 is connected to bracket 216 in a similar manner. Thus cable 350 couples first foot support assembly 212 with second foot support assembly 214, linking the foot platforms (e.g. 211, 213) of each foot support assembly to cable 350 through brackets 216, 218, to which each end of cable 350 is attached.

The central portion of lower cable 350 (i.e., between each end attached to brackets 216, 218) is guided by a series of pulleys, which guide the cable as it runs from one bracket 218 to the other bracket 216. In the illustrated example, four pairs of v-groove pulleys (i.e., 8 pulleys total) are mounted below ramps 200 and 202 at approximately evenly spaced intervals. Each pair of pulleys may be mounted on a transverse shaft, which in turn may be mounted to a bracket which is attached to the frame and/or ramps 200, 202. The illustrated example includes a pair of front pulleys 354, a pair of first center pulleys 356, a pair of second center pulleys 358 disposed rearward relative to first center pulleys 356, and a pair of rear pulleys 360. A single transverse pulley 362 is mounted rearward of pulleys 360 as part of an idler assembly. The idler assembly includes pulley 362, a mounting arm 364 and an idler spring 366. From a first end attached to bracket 218, cable 350 runs downward so as to contact the lower circumference of one of first center pulleys 356, continuing downward through one of second center pulleys 358 and through one of rear pulleys 360. Cable 350 then passes around transversely disposed idler pulley 362. Idler pulley 362 reorients the cable 350 towards a forward direction. Idler pulley 362 is mounted on mounting arm 364, which is coupled to idler spring 366. The idler assembly accounts for some variability within the cable system so as to maintain cable tension.

Leaving pulley 362, cable 350 then substantially retraces the same path in reverse, contacting the other of rear pulleys 360 and finally terminating at bracket 216. In the position illustrated in FIGS. 11B and 11C, bracket 216 is located at a position corresponding to slightly lower than second center pulley 358, while bracket 218 is illustrated at a position corresponding to a higher position on ramp 200 relative to first and second center pulleys 358, 356. As illustrated, cable 350 does not contact all of pulleys 354, 356, 358 and 360 at all foot pedal positions, but only contacts those pulleys which lie downward of ramps 200, 202 relative to the position of brackets 216, 218. For example, in the illustrated bracket and foot pedal positions, cable 350 does not contact either of front pulleys 354, and cable 350 contacts only one of first center pulleys 356 and one of second center pulleys 358. Both rear pulleys 360 are contacted by cable 350. If either foot pedal were moved up to the extreme high end of ramps 200, 202, cable 350 would contact one of front pulleys 354. As the foot pedals are reciprocally coupled, if one foot pedal were "high" the other would be "low" relative to the "high" pedal.

Lower cable 350 reciprocally relates the rearward/forward movement of each foot platform assembly to one another. As a result of the cable coupling of brackets 216 and 218 through cable 350, slack within the flexible cable system is minimized and the foot support platforms remain reciprocally linked during both the power stroke and relaxing stroke of any exercise movement. Lower cable 350 is an example of another reciprocal coupling of the foot support assemblies, as they may also be coupled by a flexible cable linkage as described in conjunction with FIG. 9.

In addition, it will be noted that the embodiment of FIGS. 11A-11C includes components for performing the function of the foot location control assembly which are fixedly mounted to the frame of device 10, rather than mounting the components on a pulley sled with is vertically adjustable. Rather than including the pulley sled components (e.g. capstan 304, first drive pulley 314, one way clutch 312, second drive pulley 316, and second drive pulley shaft gear 343) as described in conjunction with FIGS. 9 and 9A, the embodiment of FIGS. 11A-11C includes alternative structure. Assembly 300' includes a first capstan 368 around which cable 414 is wound in one direction (e.g. counter-clockwise) and a second capstan 370 around which cable 414 is wound in the other direction (e.g., clockwise). A first drive belt 372 couples first capstan 368 with breaking device 324 (e.g., an eddy current brake), while a second drive belt 374 couples second capstan 370 with breaking device 324. Each capstan 368 and 370 includes a one way clutch to ensure that belts 372 and 374 drive breaking device 324 in a single direction. Although described as being fixedly mounted to the frame, it will be understood that the alternative assembly comprising capstans 368, 370, belts 372, 374 and braking device 324 may alternatively be mounted onto a pulley sled which is vertically adjustable, as previously described.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrated and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. An exercise apparatus comprising:

a framework;

at least one curved ramp assembly mounted to said framework;

a pair of foot support assemblies, each foot support assembly being movably coupled to said at least one curved ramp assembly;

a resistance assembly coupled to said foot support assemblies so as to provide resistance against movement of said foot support assemblies by a user; and

means for adjusting a maximum stride length of said foot support assemblies, said means for adjusting being selectively operable to adjust a maximum stride length between said foot support assemblies along said at least one ramp assembly, said means for adjusting being selectively operable to alter an upper terminus and a lower terminus of each of said foot support assemblies, wherein the upper terminus and the lower terminus can be altered during exercise without altering the stride length.

2. The exercise apparatus of claim 1, wherein said means for adjusting a maximum stride length links a first foot support to a second foot support whereby said first and second foot support assemblies move in a reciprocal relationship to one another.

3. The exercise apparatus of claim 1, wherein said means for adjusting a maximum stride length of said foot support assemblies comprises a foot location control assembly.

4. The exercise apparatus of claim 3, wherein said foot location control assembly comprises a cable and pulley system, and an actuator linked thereto.

5. The exercise apparatus of claim 1, wherein each foot support assembly includes a foot support platform and a foot

platform bracket, said foot support platform being pivotally connected to said foot platform bracket.

6. The exercise apparatus of claim 5, wherein:

each foot support platform is movably coupled to said at least one ramp assembly by at least one wheel, each wheel being capable of rolling along a surface of a ramp of said at least one ramp assembly; and

wherein each foot platform bracket is movably coupled to a respective guide member said guide member being positioned below a respective ramp of said at least one ramp assembly.

7. The exercise apparatus of claim 5, wherein each foot platform bracket is movably coupled to a respective guide member by an upper bracket wheel mounted to said foot platform bracket and at least one lower bracket wheel mounted below said upper bracket wheel such that said upper bracket wheel rests upon a top surface of said guide member and said lower wheel contacts and rolls along a bottom surface of said guide member.

8. An exercise apparatus comprising:

a framework;

at least one ramp assembly mounted to said framework, said at least one ramp assembly comprising a ramp having a front end, a rear end, and a first radius, and a guide member having a front end, a rear end, and a second radius, said guide member being positioned below and extending substantially along the length of said ramp, wherein said rear end of said guide member is separated from said rear end of said ramp by a first distance, and wherein said front end of said guide member is separated from said front end of said ramp by a second distance, said second distance being greater than said first distance; and

a pair of foot support assemblies, each foot support assembly being movably coupled to said at least one ramp assembly, wherein a first foot support assembly of said pair of foot support assemblies is movably coupled to said ramp and said guide member.

9. The exercise apparatus of claim 8, wherein said first radius is different from said second radius.

10. The exercise apparatus of claim 8, wherein said guide member is positioned substantially directly below said ramp.

11. The exercise apparatus of claim 8, wherein said at least one ramp assembly comprises a first ramp assembly and a second ramp assembly.

12. The exercise apparatus of claim 11, wherein one of said pair of foot support assemblies is coupled to said first ramp assembly and the other of said pair of foot support assemblies is coupled to said second ramp assembly.

13. The exercise apparatus of claim 8, wherein each foot support assembly includes a foot support platform and a foot platform bracket, said foot platform bracket being pivotally connected to said foot support platform.

14. The exercise apparatus of claim 13, wherein said foot platform bracket comprises at least one wheel for coupling with said ramp or said guide member.

15. The exercise apparatus of claim 8, wherein said first radius of said ramp and said second radius of said guide member of said at least one ramp assembly are configured to provide an ergonomic articulation to said pair of foot support assemblies.

16. The exercise apparatus of claim 13, wherein said pair of foot support assemblies are configured such that an angle of inclination of each respective foot platform changes when said foot support assemblies are moved from one position along said at least one ramp assembly to another position along said at least one ramp assembly.

17. The exercise apparatus of claim 13, wherein said ramp of said ramp assembly has a curved shape such that a distance traveled by said foot platform along said ramp is different from a distance traveled by said foot platform bracket along said guide member so as to impart an ergonomic articulation upon said foot platforms as said foot platforms travel along said at least one ramp assembly.

18. An exercise apparatus comprising:

a framework;

a first ramp assembly mounted to said framework, said first ramp assembly comprising a first ramp having a front portion, a rear portion, and a first curvature and a first guide member having a front portion, a rear portion, and a second curvature, said first ramp being positioned above and extending along the length of said first guide member, wherein said rear portion of said first guide member is separated from said rear portion of said first ramp by a first distance, and wherein said front portion of said first guide member is separated from said front portion of said first ramp by a second distance, said second distance being greater than said first distance;

a second ramp assembly mounted to said framework, said second ramp assembly comprising a second ramp having a front portion, a rear portion, and a first curvature and a second guide member having a front portion, a rear portion, and a second curvature, said second ramp being positioned above and extending along the length of said second guide member, wherein said rear portion of said second guide member is separated from said rear portion of said second ramp by said first distance, and wherein said front portion of said second guide member is separated from said front portion of said second ramp by said second distance; and

a pair of foot support assemblies, one foot support assembly being movably coupled to said first ramp and to said first guide member, and the other of said foot support assemblies being movably coupled to said second ramp and to said second guide member.

19. The exercise apparatus of claim 18, wherein said first curvature of said first ramp assembly differs from said second curvature of said first guide member; and

wherein said first curvature of said second ramp assembly differs from said second curvature of said second guide member.

20. The exercise apparatus of claim 18, wherein said first foot support assembly comprises a first foot platform and a first foot support bracket pivotally coupled thereto, and wherein said second foot support assembly comprises a second foot platform and a second foot support bracket pivotally coupled thereto, each of said brackets comprising a plurality of wheels and being movably coupled to a respective guide member.

21. An exercise apparatus comprising:

a framework;

at least one curved ramp assembly mounted to said framework, said at least one curved ramp assembly including a substantially horizontal portion and a substantially vertical portion;

a pair of foot support assemblies, each foot support assembly being movably coupled to said at least one curved ramp assembly;

a foot location control assembly coupled to said pair of foot support assemblies and configured to selectively constrain the movement of said foot support assemblies to be within said substantially horizontal portion of said at least one ramp assembly when in a first configuration and to constrain the movement of said foot support

assemblies to be within said substantially vertical portion of said at least one ramp assembly when in a second configuration, wherein said foot location control assembly can change between said first and second configurations without movement of said at least one curved ramp relative to said framework.

22. The exercise apparatus of claim **21**, wherein said foot location control assembly is configured to be selectively movable to adjust an upper and lower terminus of movement of said foot support assemblies along said at least one ramp assembly.

23. The exercise apparatus of claim **21**, wherein said foot location control assembly is coupled to said pair of foot support assemblies and configured to selectively constrain the movement of said foot support assemblies along said at least one ramp assembly to be at least partially within said upper portion of said ramp assembly and at least partially within said lower portion of said ramp assembly.

24. The exercise apparatus of claim **21**, wherein said foot location control assembly links a first foot support assembly to a second foot support assembly such that said first and second foot support assemblies move in a reciprocal relationship to one another.

25. The exercise apparatus of claim **21**, wherein said foot location control assembly comprises a cable and pulley system and an actuator linked thereto.

26. The exercise apparatus of claim **25**, wherein said cable and pulley system comprises at least one cable and at least one pulley, said at least one pulley being mounted on a pulley sled, and wherein said at least one cable is linked to said at least one pulley.

27. The exercise apparatus of claim **26**, wherein said pulley sled is movable relative to said framework by said actuator.

28. The exercise apparatus of claim **27**, wherein said actuator comprises an actuator bracket and a motor assembly.

29. The exercise apparatus of claim **28**, wherein said motor assembly comprises a motor and a lead screw linked to said motor, said actuator bracket being threadedly mounted on said lead screw, said actuator bracket being mounted to said pulley sled.

30. The exercise apparatus of claim **29**, wherein the rotation of said lead screw by said motor causes movement of said pulley sled relative to said framework.

31. The exercise apparatus of claim **29**, wherein said pulley sled is mounted to said framework by a pair of spaced apart guide rails mounted to a first side panel and a second side panel of said framework.

32. An exercise apparatus comprising:

a framework;

at least one ramp assembly mounted to said framework, said at least one ramp assembly including a curved configuration;

a pair of foot support assemblies, each foot support assembly being movably coupled to said at least one ramp assembly; and

a resistance assembly coupled to said foot support assemblies so as to provide resistance against movement of said foot support assemblies by a user, wherein said resistance assembly is mounted to a cable and pulley system comprising a pulley sled, said pulley sled being adjustable with respect to said framework, wherein adjustment of said pulley sled with respect to said framework enables adjustment of a lower terminus and an upper terminus of each foot support assembly of said pair of foot support assemblies, wherein the upper terminus and the lower terminus can be adjusted during exercise without altering the stride length.

33. The exercise apparatus of claim **32**, wherein the resistance assembly comprises:

a capstan mounted on a first shaft, said first shaft being mounted to said pulley sled;

a first one-way clutch mounted upon said first shaft;

a first drive pulley mounted upon said first shaft, said first drive pulley including a second one-way clutch;

a gear mounted upon a second shaft, said second shaft being mounted to said pulley sled, said gear being coupled with said first one-way clutch;

a second drive pulley mounted upon said second shaft;

said first drive pulley and said second drive pulley being coupled to a braking device.

34. The exercise apparatus of claim **33**, wherein said braking device comprises one or more of a freewheel and an eddy brake.

35. An exercise apparatus comprising:

a framework including a front portion and a rear portion;

at least one ramp assembly mounted to said framework, each ramp assembly including a curved configuration;

first and second foot support assemblies, each foot support assembly having a front end and a rear end, each foot support assembly being movably coupled to said at least one ramp assembly; and

a flexible coupling mechanism being configured to couple said first foot support assembly to said second foot support assembly, said flexible coupling mechanism including a first cable and pulley system and a second cable and pulley system, said first cable and pulley system configured to adjust an upper terminus and a lower terminus of said first and second foot support assemblies and to couple said front end of each of said first and second foot support assemblies to said front portion of said framework, and said second cable and pulley system configured to couple said rear end of each of said first and second foot support assemblies to said rear portion of said framework, wherein the upper terminus and the lower terminus can be adjusted during exercise without altering the stride length, wherein adjustment of the upper terminus and the lower terminus alters a stride path of said first and second foot support assemblies.

36. The exercise apparatus of claim **35**, wherein a resistance assembly is coupled to said first and second foot support assemblies by said flexible coupling mechanism so as to provide resistance against movement of said first and said second foot support assemblies by a user.

37. The exercise apparatus of claim **36**, wherein said flexible coupling mechanism comprises:

a pair of front cables, each front cable being attached at one end to a respective one of said first and second foot support assemblies, and an opposite end of each of said front cables being attached to a respective drive pulley of a pair of drive pulleys; and

a capstan cable attached at one end to one of said drive pulleys, said capstan cable being coupled to a capstan, and an opposite end of said capstan cable being attached to the other of said pair of drive pulleys.

38. The exercise apparatus of claim **35**, wherein the effective length of said flexible coupling mechanism is adjustable so as to adjust a maximum stride length of said foot support assemblies.

39. The exercise apparatus of claim **38**, wherein a foot location control assembly adjusts the effective length of said flexible coupling mechanism.

40. The exercise apparatus of claim 39, wherein the termini of movement of each foot support assembly is determined by the position of said foot location control assembly such that a user may select a position for said foot location control assembly corresponding to a substantially vertical portion of said at least one ramp assembly, a substantially horizontal portion of said ramp assembly, or any position therebetween.

41. The exercise apparatus of claim 39, wherein each foot support assembly includes a foot support platform, a foot platform bracket pivotally connected to said foot support platform, and a spring loaded drum pulley configured to maintain tension within said at least one cable so as to draw in any cable slack.

42. The exercise apparatus of claim 37, further comprising a lower cable attached at one end to a respective one of said first and second foot support assemblies, and an opposite end of said lower cable being attached to the other of said foot support assemblies so as to maintain tension within said flexible coupling mechanism.

43. The exercise apparatus of claim 35, further comprising a pair of spaced apart handles, each handle being fixedly attached at a first end to a respective upper pulley, each of said upper pulleys being coupled to a respective one of said first and said second foot support assemblies by said flexible coupling mechanism.

44. The exercise apparatus of claim 35, wherein said at least one ramp assembly, said flexible coupling mechanism, and said foot support assemblies are configured to provide a stride length of at least about 30 inches.

45. The exercise apparatus of claim 35, wherein said flexible coupling mechanism connects said first foot support assembly to said second foot support assembly such that movement of said first or said second foot support assembly causes a reciprocal movement of the other of said first and second foot support assemblies.

46. An exercise apparatus comprising:

a framework;

at least one ramp assembly mounted to said framework, said at least one ramp assembly including an upper ramp defining a first curve extending between a first end and a second end of said upper ramp and a lower guide member defining a second curve extending between a first end and a second end of said lower guide member, wherein said lower guide member is positioned below and extends substantially along the length of said upper ramp, wherein said first end of said lower guide member is separated from said first end of said upper ramp by a first distance, and wherein said second end of said lower guide member is separated from said second end of said upper ramp by a second distance, said second distance being greater than said first distance;

a pair of foot support assemblies movably mounted to said at least one ramp assembly, wherein a first foot support assembly of said pair of foot support assemblies is movably coupled to said ramp and said guide member;

wherein a maximum length of the movement of said foot support assemblies is substantially the entire length of said at least one ramp assembly; and

wherein a shape of the movement of said foot support assemblies is substantially the shape of said first curve.

47. An exercise apparatus comprising:

a framework;

at least one ramp assembly mounted to said framework, said at least one ramp assembly including a curved configuration;

first and second foot support assemblies, each foot support assembly having a front end and a rear end, each foot support assembly comprising a foot support platform and a foot platform bracket pivotally connected to said foot support platform, each foot support assembly being movably coupled to said at least one ramp assembly;

a resistance and adjustment assembly including a first cable and pulley system interconnecting said front end of said first foot support assembly to said front end of said second foot support assembly so as to provide resistance against movement of said first and second foot support assemblies by a user, said resistance and adjustment assembly adapted to selectively adjust an upper terminus and a lower terminus of said first and second foot support assemblies, wherein the upper terminus and the lower terminus can be adjusted during exercise without altering the stride length, wherein adjustment of the upper terminus and the lower terminus alters a stride path of said first and second foot support assemblies; and

a flexible coupling mechanism including a second cable and pulley system linking said rear end of said first foot support assembly to said framework and linking said rear end of said second foot support assembly to said framework.

48. The exercise apparatus of claim 47, wherein said resistance and adjustment assembly is fixed with respect to said framework.

49. The exercise apparatus of claim 47, wherein each end of a cable of said second cable and pulley system is attached to a respective foot support bracket such that said cable is linked at each end to a respective foot support platform via the respective foot support bracket.

50. An exercise apparatus comprising:

a framework comprising a frame and a ramp assembly, said ramp assembly comprising at least one ramp, said at least one curved ramp having a first end and an opposing second end;

a pair of foot support assemblies, wherein each foot support assembly is movably coupled to said ramp assembly; and

means for adjusting the neutral body position of a user with respect to a support surface and for selectively adjusting an upper terminus and a lower terminus of each foot support assembly of said pair of foot support assemblies, wherein the upper terminus and the lower terminus can be adjusted during exercise without altering the stride length, wherein adjustment of the upper terminus and the lower terminus alters a stride path of said first and second foot support assemblies.

51. The exercise apparatus of claim 50, wherein said means for adjusting the neutral body position of the user with respect to the support surface comprises an adjustable pulley system coupled to said framework.

52. The exercise apparatus of claim 50, wherein said means for adjusting the neutral body position of the user with respect to the support surface comprises a lead screw.

53. An exercise apparatus comprising:

a framework comprising a frame and a ramp assembly, said ramp assembly comprising at least one ramp, said at least one curved ramp having a first end and an opposing second end;

a pair of foot support assemblies, each foot support assembly being movably coupled to said ramp assembly; and

an adjustment assembly configured to selectively alter the neutral body position of a user with respect to a support surface, said adjustment assembly being selectively operable to alter an upper terminus and a lower terminus of each foot support assembly of said pair of foot support assemblies, wherein the upper terminus and the lower

terminus can be altered during exercise without altering the stride length, wherein adjustment of the upper terminus and the lower terminus alters a stride path of said first and second foot support assemblies.

54. The exercise apparatus of claim **35**, wherein said second cable and pulley system couples said rear end of each of said first and second foot support assemblies to a pulley secured to said rear portion of said framework.

55. The exercise apparatus of claim **35**, wherein said second cable and pulley system couples said rear end of each of said first and second foot support assemblies directly to said rear portion of said framework.

56. The exercise apparatus of claim **54**, wherein said second cable and pulley system comprises a rear cable that passes through said pulley and is secured at a first end to said first foot support assembly and is secured at a second end to said second foot support assembly.

57. The exercise apparatus of claim **55**, wherein said second cable and pulley system comprises a first rear cable that couples said first support assembly directly to said rear portion of said framework, and a second rear cable that couples said second foot support assembly directly to said rear portion of said framework.

58. The exercise apparatus of claim **47**, wherein said second cable and pulley system links said rear end of each of said first and second foot support assemblies to a pulley secured to said framework.

59. The exercise apparatus of claim **47**, wherein said second cable and pulley system couples said rear end of each of said first and second foot support assemblies directly to said framework.

60. The exercise apparatus of claim **58**, wherein said second cable and pulley system comprises a rear cable that passes through said pulley and is secured at a first end to said first foot support assembly and is secured at a second end to said second foot support assembly.

61. The exercise apparatus of claim **59**, wherein said second cable and pulley system comprises a first rear cable that couples said first support assembly directly to said framework, and a second rear cable that couples said second foot support assembly directly to said framework.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,658,698 B2
APPLICATION NO. : 11/832496
DATED : February 9, 2010
INVENTOR(S) : Pacheco et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On Title Page 3, Item 56 Right Column

Other Publications, change "www.us.commerciallifefitness.com, "Summit Trainers," printed Oct. 17, 2006 (3 pages)." to --www.us.commercial.lifefitness.com, "Summit Trainers," printed Oct. 17, 2006 (3 pages).--

On Title Page 4, Item 56 Left Column

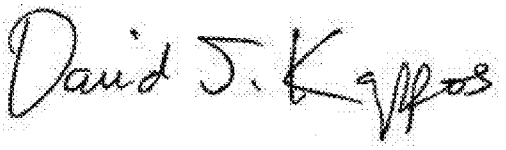
Other Publications, change "Horizon Series E30 E20, printed on Jul. 27, 2004 from www.horizonfitness.com/horizon-series/ellipticals/e20.php, (1 page)." to --Horizon Series E30 E20, printed on Jul. 27, 2004 from www.horizonfitness.com/horizon-series/ellipticals/e20.php, (1 page).--

Other Publications, change "Internet archive for ocatnefitness.com, "Home Products," available on information and belief at least as early as Jun. 12, 2006 (1 page)." to --Internet archive for ocatnefitness.com, "Home Products," available on information and belief at least as early as Jun. 12, 2005 (1 page).--

On Title Page 4, Item 56 Right Column

Other Publications, change "Internet archive for www.octanefitness.com, pages entitled "Why are elliptical trainers so popular," "Effectiveness of Elliptical Trainerss," Impact your life, not your body! "Total Body Workout," "Minimal Maintenance," "Small Footprint," "Retailers," available on information and belief at least as early as Dec. 31, 2005 (7 pages)." to --Internet archive for www.octanefitness.com, pages entitled "Why are elliptical trainers so popular," "Effectiveness of Elliptical Trainers," "Impact your life, not your body!" "Total Body Workout," "Minimal Maintenance," "Small Footprint," "Retailers," available on information and belief at least as early as Dec. 31, 2005 (7 pages).--

Signed and Sealed this
Eleventh Day of September, 2012



David J. Kappos
Director of the United States Patent and Trademark Office

Drawings

Sheet 1, replace Figure 1 with the figure depicted below, wherein the second instance of "102" has been removed

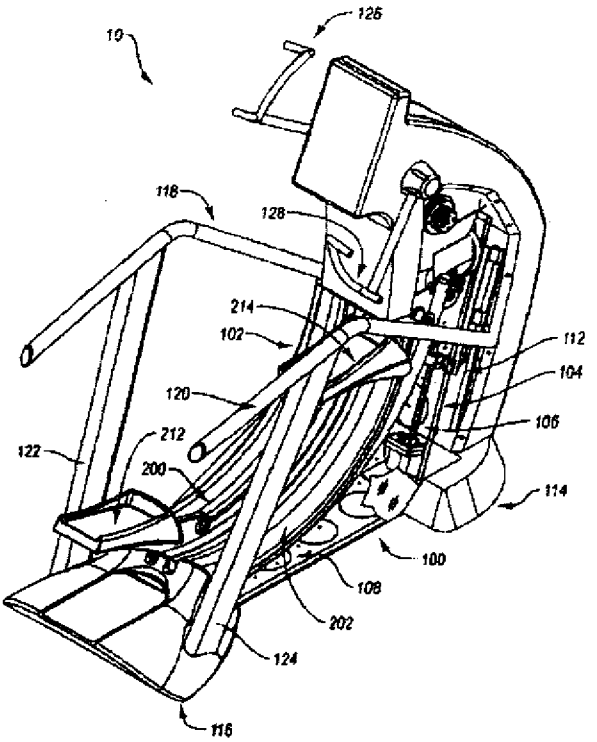


FIG. 1

Sheet 6, replace Figure 5A with the figure depicted below, wherein the lower wheels "228" and "230" have been correctly labeled

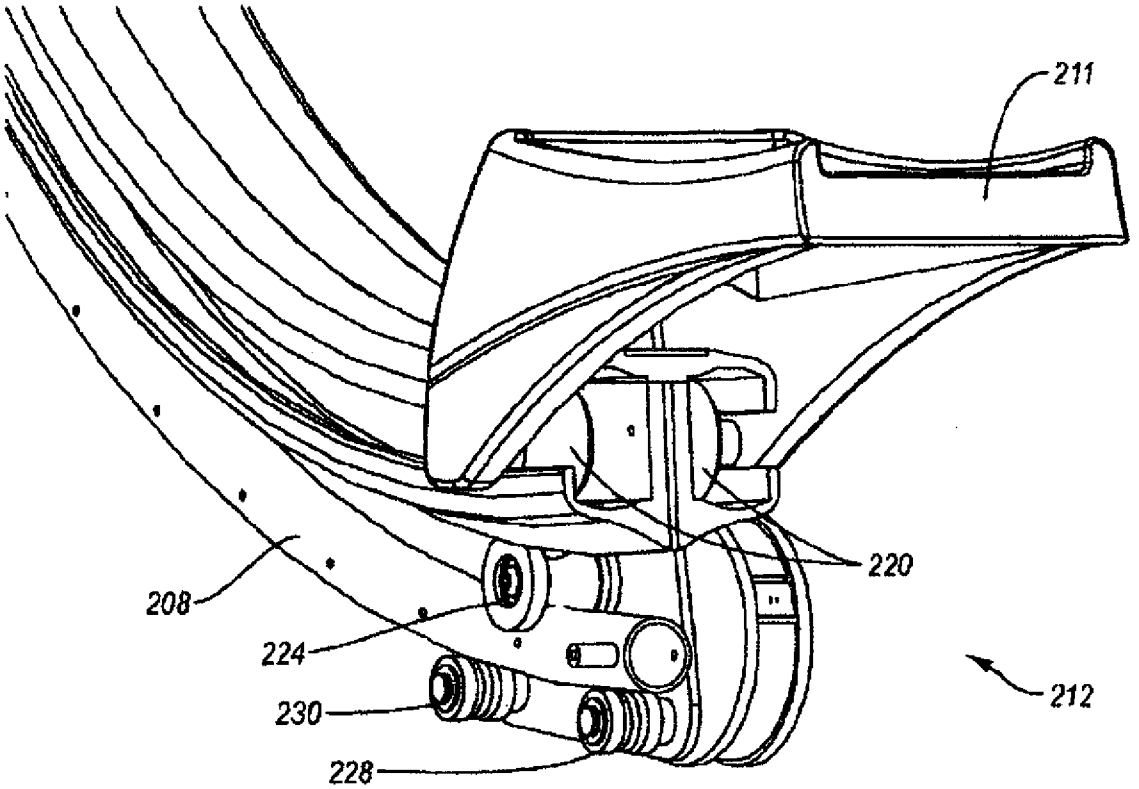


FIG. 5A

Sheet 6, replace Figure 5B with the figure depicted below, wherein the lower wheels "228" and "230" have been correctly labeled, and the foot platform bracket has been changed from "206" to --216--

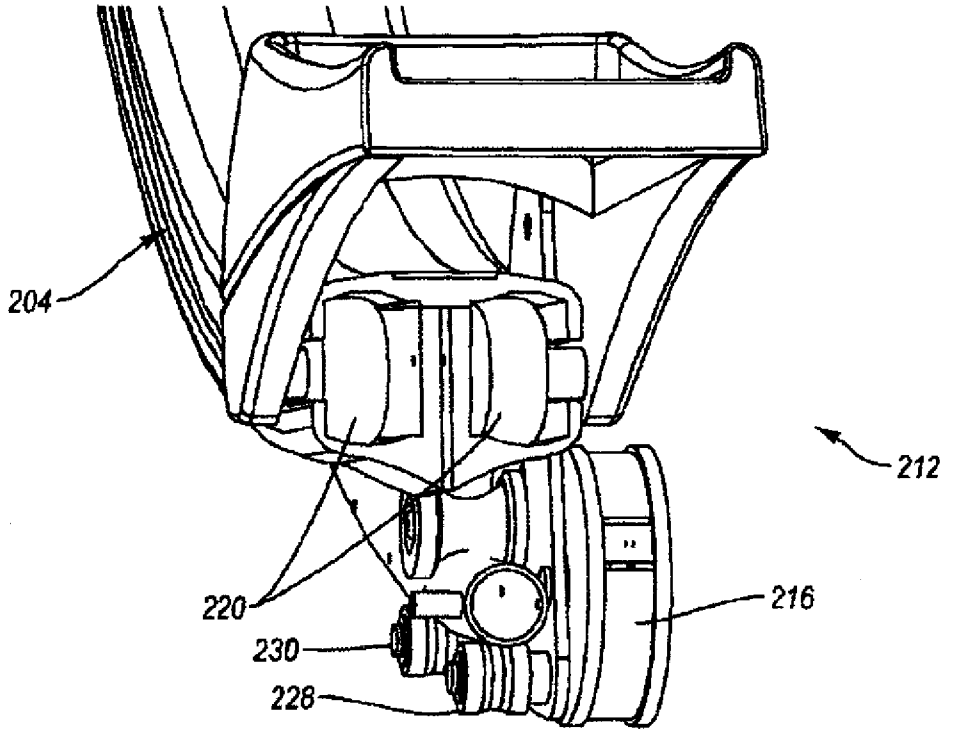


FIG. 5B

Sheet 17, replace Figure 11A with the figure depicted below, wherein the assembly has been changed from "300" to --300'--

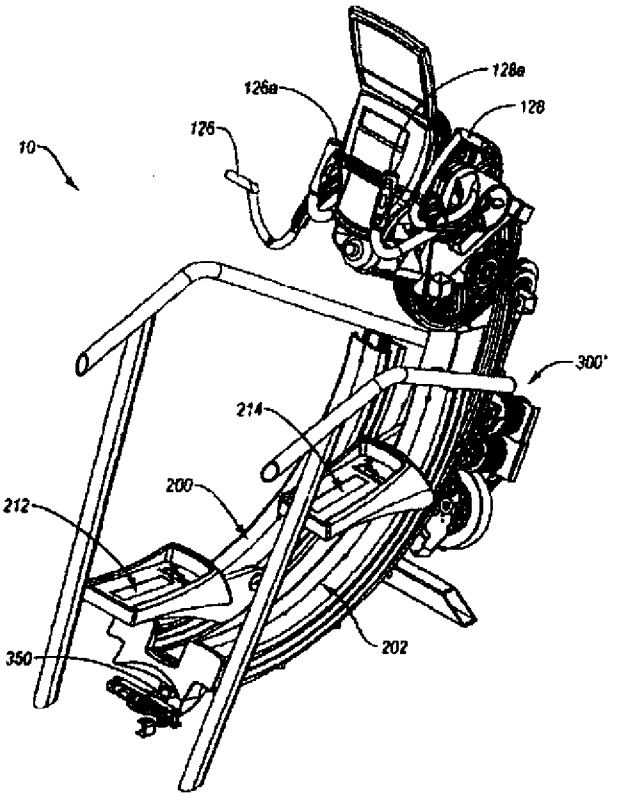


FIG. 11A

Column 1
Line 10, insert an --"-- after "ASSEMBLY,"

Column 3
Line 23, change "having" to --have--

Column 4
Line 15, delete "and"

Column 6
Line 59, change "is" to --as--

Column 8
Line 34, change "create" to --to create--

Column 11
Line 20, delete the first instance of "each"

Column 12
Line 44, change “each” to --each of--

Column 13
Line 65, change “FIG.” to --FIGS.--

Column 14
Line 19, delete “as”
Line 24, insert a --,-- after “example”
Line 33, delete “an”

Column 16
Line 5, change “with” to --which--
Line 10, change “alternative” to --an alternative--
Line 15, change “breaking” to --braking--
Line 17, change “breaking” to --braking--
Line 19, change “breaking” to --braking--
Line 28, change “illustrated” to --illustrative--